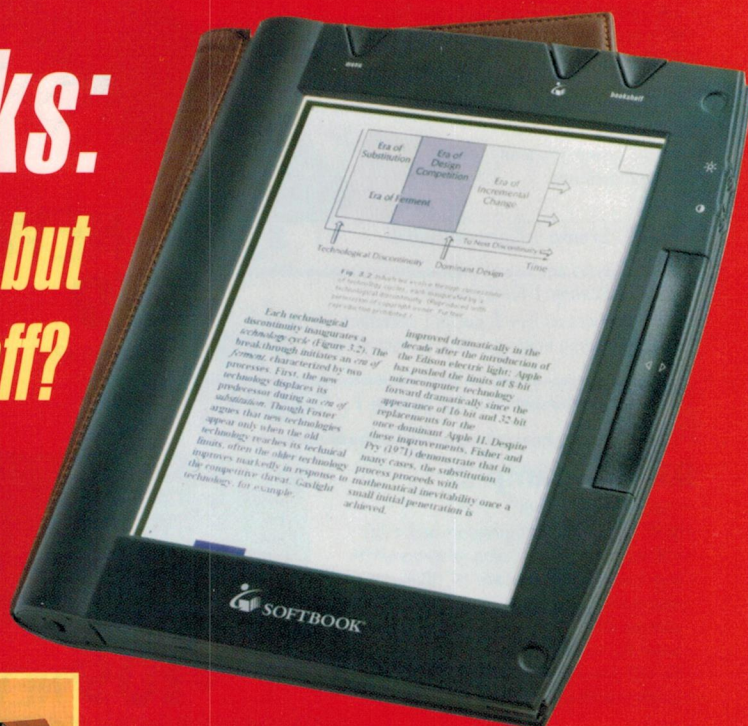


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K 1402

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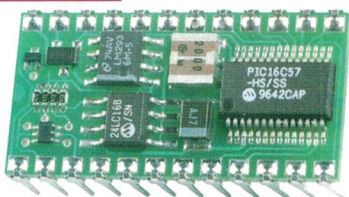
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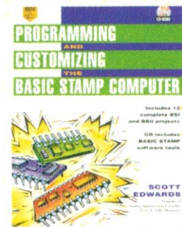
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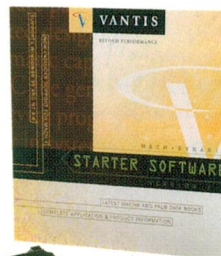
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Bring your creative ideas to life from your personal computer using Vantis programmable logic.

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K 1450



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December 1998 Volume 60, No. 12 [www.electronicsaustralia.com.au](http://www.electronicsaustralia.com.au)

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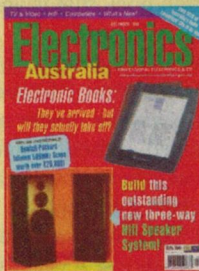
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### On the cover

Electronic books like the Softbook are now on sale in the USA, for less than \$300 and with a built-in modem for downloading 'books' via the Internet. See our feature article starting on page 16. If you're after a new hifi speaker system, the new JC50 kit is well worth considering — it's capable of excellent results. (See page 42)



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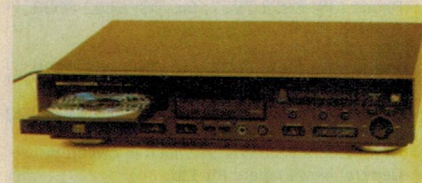
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### Pet that eats batteries



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### CD player, MD recorder



**10** Louis Challis was very impressed with the performance of the new Marantz CM635, especially with MDs



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# Letters to the Editor

## Embedded micros & Y2K

I read with interest the letter from Nicholas Smith in the June 1998 Information Centre regarding embedded microprocessors and year 2000 compatibility.

I work in the IT section of a large Australian corporation where the Y2K problem is taken very seriously. I have a colleague whose wife works in the computer industry. They visited a friend who was boasting that their business did not have to worry about year 2000 compatibility, since they do not have any computers in their business. My colleague went to their air conditioner control panel and proceeded to advance the time on the panel to 11:55pm, 31st of December 1999. Five minutes later the air conditioner stopped. This certainly highlights a concern for all of us.

From what I have seen there are several types of electronic equipment with regards to the date function. Those without any date function, those that are internally programmed for servicing or diagnostic purposes, those that have some form of timing but do not recognise the year, and finally the equipment that stores the full date including the year. The last two are easily recognised since they have a display to set the time and date.

For example I have two video recorders. The older unit has a time and day function but no date. The result is that it does not know about the month or year, so that this will have no problem come the year 2000. It is possible to programme channels up to two weeks in advance since it knows about this week and next week, but nothing beyond that. The second video recorder however records the full date. To test it, I set it to 11:55pm 31st of December 1999 and to begin recording five minutes after midnight. Sure enough, 10 minutes later the recorder fired up and began recording. The date was set correctly when I checked, to the 1st of January 2000. Although not a comprehensive check it was enough to satisfy me.

There is really no alternative but to test all equipment that has a date and time function for compatibility. If it does cause problems, the owner should contact the manufacturer to see if there is an update

available — or in the case of cheaper equipment such as a \$20 clock radio, plan to replace it before the 1st of January 2000.

It is sometimes more difficult to discern between equipment without any date function and internally stored date and time function. The latter would be quite rare and I have not seen any myself. Anybody with a technical background should be able to identify equipment that may have an inbuilt diagnostics time and date. If the equipment is critical I would suggest contacting the manufacturer for advice on whether the equipment does have the date and time stored internally and if it is year 2000 compatible. I would suggest that it would be quite rare for domestic equipment to have a 'hidden' diagnostic type date and time function.

I suppose the best approach is to test everything in sight, first for the 1999 to 2000 transition and then for function in the year 2000.

John Hancock (by e-mail)

## Help wanted

I am attempting to locate a fault in a Telequipment D61 oscilloscope. So far I have been unable to locate a circuit diagram or printed circuit board layout diagram, and would greatly appreciate it if anyone could supply photocopies of these. My full address is 18A Brixton Road, Whangaparaoa, Auckland 1463, New Zealand.

Congratulations on a great magazine.

E. Davenport, Auckland NZ

## Basic Electronics

Congratulations on the publication *Basic Electronics* by Peter Phillips. It is very well written book that is very affordable — a rarity in Australia.

A few congratulatory comments:

1. It is a great introduction to the field. It has given the reader a good insight into the field, without the mistake of being too simple or shallow and not covering the field properly.
2. I found it easy to read with excellent explanations. A well written book is truly valuable.
3. Not too much maths or needless explanation for a basic guide, keeping it clear and concise. Useful references to theoretical areas and mathematics where



the reader can delve into the topic at a greater depth at a later stage.

4. Price — affordable by the average Australian or the person who wishes to read a large volume of material.

I would again like to thank you for writing and publishing such a useful book. I was surprised to find such a publication in Australia; we tend to fall seriously behind on affordable material that is well written, in comparison to the USA.

**Anthony Moeller, Eden Hills SA.**

## Parts for old organ

Hopefully someone might be able to help. I have a friend, a retired tech, who is rebuilding an old Wurlitzer organ — model 475.

He is looking for some components, which have so far proved hard to find. These are National LSI 147247 (40-pin frequency divider) and some 800-series transistors — mainly 831, 832, 833 and 891. Any information on these, or currently compatible types, would be much appreciated.

**Leon Barry (leon@treko.net.au)**

## Only two SIMMs needed

I too read the article about \$100 PCs that Jarrad Mitchell refers to in his letter October 98, and was jarred by the use of two 30-'pin' SIMMs. But in fact that's quite OK — because 386 PCs only require two!

When 486s came out the requirement that you had to go all the way to 4MB was an impost. There were even a few boards around that used SIMMs with 286 CPU's. I think you only needed one SIMM for the 'Advanced Technology' CPU, for example.

I think with most DIL memory you fit it in groups of eight. I forget now — it's not been so many years, but we have seen a lot since then.

**Kevin Shackleton (by e-mail) ♦**

Letters published in this column express the opinions of the correspondents concerned, and do not necessarily reflect the opinions or policies of the staff or publisher of Electronics Australia. We welcome contributions to this column, but reserve the right to edit letters which are very long or potentially defamatory.



## If / can, you too can now make surprisingly good audio CDs, using your PC...

**L**IKE MANY of EA's readers, I'm sure, I've had a long-standing interest in audio recording and reproduction. In my case I think it started as a teenager back in the early 1950s, when I played with recording radio shows on lacquered aluminium discs, using a borrowed recorder...

After I joined EA in 1960, I began building tape recorders, which delivered far more satisfying results. These were accompanied by a succession of amplifiers, turntables and speaker systems, generally achieving better performance as my energy level, bank account and other commitments would allow. Then about 1980 my treasured turntable and

magnetic pickup were stored away, along with the vinyl LPs and other discs, to make way for the CD players and compact discs that were to replace them as the preferred listening medium. When my reel-to-reel tape deck and cassette deck in turn developed mechanical problems, these were also stored away; there just didn't seem to be the time or motivation to fix them.

But recently, things changed — and all because I invested in one of those CD-R writer drives for my home PC. I soon found that as well as recording data CDs, the drive and PC were quite capable of recording audio CDs. Then the penny dropped:

why not try transferring some of those prized old disc and tape recordings onto CDs, so they could be played more easily and also (hopefully) better preserved?

So the old turntable and tape decks were dug out, dusted off and refurbished, and I've been having great fun copying old recordings to hard disk, cleaning them up and putting them onto CDs. Of course I needed to build a 'mini console' to make things easier, and that's how the Recording Front End project in the September issue came about. I've also had to try out a variety of digital recording, WAV file editing and noise reduction programs, which I hope to write more about shortly.

I guess what I'm trying to say is that perhaps you mightn't have noticed, but affordable PC-based digital audio recording technology has now well and truly arrived — and if you're like me, with an interest in audio recording and reproduction, you might find it very satisfying and enjoyable too.

Mind you, I soon realised that like most people I've become accustomed to the low noise and wide dynamic range of CDs, so the clicks and plops from old discs (and the hiss from old tapes) were now quite painfully obvious. That ultimately led me to seeking advice from the experts at the National Film and Sound Archive in Canberra, on the best techniques for cleaning and playing old discs and tapes. You'll find out what I discovered in the article starting on page 20, in this issue. I hope it's of interest.

By the way, the NFSA has been doing great work themselves, restoring all kinds of historic recordings and making some available on CDs. They've now released a total of five different double-CD sets of classic Australian radio programs, from the 'golden era' of radio: the 1930s, 40s and 50s. You can buy them at the NFSA's own offices, or by mail (see page 23), or from some ABC Shops. Following my visit, though, and when they heard that I was writing an article about sound preservation, the NFSA also sent us two complete sets of their *Australia's Radio Favourites* CDs, to give away. So if you'd like to win one, turn to page 26 for details of our little contest.

Finally, as this is the last issue for 1998, I'd like to wish all of our readers and advertisers a happy and safe Christmas and New Year season, from all of us on EA's little team. I hope we'll see you with us again next year, too.

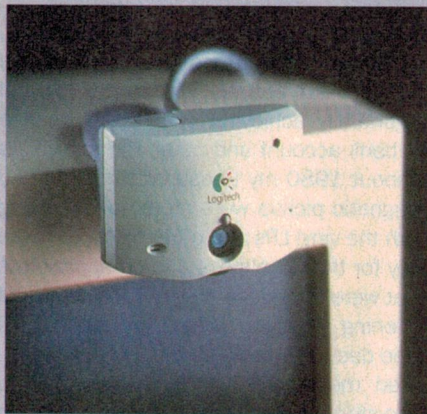
**Jim Rowe**



# WHAT'S *new*

in the ever-changing world of electronics

## Logitech's USB video camera for Windows 98



Computer peripherals maker **Logitech** has released a PC digital video camera specifically designed to take advantage of the power of Microsoft Windows 98 and the USB (Universal Serial Bus) interface.

The Logitech QuickCam Home uses camcorder technology and is said to deliver 'superb video quality' at up to 30 frames per second, along with sharp still images. It features a built-in microphone for one-step installation and synchronised natural communication, along with a novel TrueView mounting design for natural, eye-level presentation. It's all included in the very competitive price of \$299.

Moreover, the powerful image processing technology is built into the camera, leaving the PC free to perform other tasks.

Basic system requirements include Windows 98, a Pentium 166MHz or faster processor, available USB host, 16MB RAM, a CD-ROM drive, a 16-bit colour display, Windows-compatible sound card, mouse and speakers. For sending and receiving video mail or still images, a 14.4kb/s or better modem is also required.

For more information circle **140** on the reader service card or contact Logitech Australia, Level 2, 633 Pittwater Road, Dee Why 2099.

## TDK releases recordable audio CDs

To coincide with recent developments in 'home use' CD recorders, TDK are marketing a number of recordable CD media including CD-RXG, which is specifically designed for home use, audio-only CD-R recording and playback. Using a CD-RXG and a home CD-R recorder you can record up to 74 minutes of high-quality sound from both analog and digital sources on to a disc that can be

played on any conventional CD player, portable CD player or in-car CD player.

TDK says its CD-RXG disc is engineered and manufactured to the same exceedingly high quality standards as the company's professional multimedia CD-Rs. It features a multilayer structure based on a plastic substrate, etched with a 'pre-groove' that serves as a tracking guide for the laser. The substrate is coated with a special organic dye solution which forms the recording layer. A thin gold reflective layer is then deposited on the

recording layer, followed by protective and label coatings. The discs are claimed able to be played more than a million times with no audible degradation in sound quality.

CD-RXG Recordable Compact Discs are available in both 74-minute (CD-RXG74) and 60-minute (CD-RXG60) versions, with prices starting at \$7.95.

For more information circle **143** on the reader service card or contact TDK (Australia), 22 Lambs Road, Artarmon 2064.

## Kodak improves its DC210 zoom camera

Kodak Australia is now shipping an improved version of its award-winning DC210 Zoom camera, the DC210 Plus Zoom. Available at an expected street price of \$1399, the new model underscores the company's strategy to make it easier and more affordable to work with high-quality digital images.

"This camera is one more example of our commitment to meeting the picture-taking needs of our customers, making it easier and more affordable for the average consumer to enter the digital age", said Brendan Lovelock, Kodak's regional business general manager, Digital and Applied Imaging.

The Kodak DC210 Plus is a megapixel zoom digital camera that features a 1152 x 864 pixel scan image sensor which can produce vivid 5 x 7 photo-realistic prints. Users can also select VGA resolution (640 x 480)



pictures for web pages and other applications that do not require full image quality.

New enhancements to the DC210 Plus include a 20% increase in battery life, faster startup and image storage, a multi-lingual LCD screen with award winning user interface, an 'About' screen that displays the

number of images taken with and without a flash, a date stamp that lets users choose how the date is written (e.g., M/D/Y,

D/M/Y), a video out slide show and an exposure lock that records and locks exposure information about an image, ensuring that succeeding images use exactly the same information, if desired. In addition, Kodak has included an AC adapter in the package, along with an 8MB Compact Flash card and Kodak Picture Easy software.

The DC210 Plus has 2x optical zoom (29-58mm equivalent), a built-in automatic flash and a 1.8" liquid crystal display (LCD). The colour LCD may be used as a viewfinder to assist in framing close-up shots, and it lets users review, organize and delete pictures. The camera weighs 340g and fits easily into a coat pocket.

For more information, circle **142** on the reader service card or call Kodak's customer helpline on 1800 674 831.





## Sleek wireless keyboard for Web TV

contoured to fit closely to the human form. The underside of the board is sculpted to rest comfortably, without slipping, on the user's lap. And it's made using an unconventional material: thermoplastic rubber.

"We needed the FreeBoard Beamer to be an extension of a person's body, so it's hardly noticeable as the user surfs the Internet from the easy chair

in the family den", said Mark Dzierk, VP of design at Herbst Lazar Bell Inc. (HLB), the design company that created the FreeBoard. "So in addition to focusing on the contour of the FreeBoard, we evaluat-

ed materials that would be interactive-friendly. That's when we looked at Santoprene rubber."

Originally commissioned by Compaq Corporation and now marketed in the US by Sejin America, Inc., the FreeBoard Beamer was developed to interface with a TV/PC combination monitor. Part of a new wave of user-friendly, Internet-driven interactive technologies, the unit integrates mouse controls, a standard trackball and a battery-powered infrared transmitter, and provides full functionality without having to be tethered to the host. This means users can effectively interface with their Web television systems lying on the couch, reclining in an easy chair or sitting at a desk. It weighs only 900 grams and measures 432 x 228 x 44mm, and transmits keyed-in information to a receiving unit plugged into a CPU or Web box.

## High-end CD player/receiver for cars

Pioneer's new DEH-P946 top-of-the-range stand alone car CD player/receiver with multi-CD control is claimed to represent the latest state of the art in car audio. Pioneer describes it as 'bristling' with new technologies, including 20-bit sound with hi-bit transfer technology, built-in DSP (Digital Signal Processor), Digital

Sound Field Control (SFC), Hi-bit Legato Link Conversion, Auto Sound Leveliser (ASL), Auto Equaliser, Detachable Face Security and a multi-function remote.

The DEH-P946 also provides 'four channel 40 x 40W' output amplifiers, a 13-band digital

graphic equaliser and an easy to read multicolour display.

Pioneer's digital Sound Field Control (SFC) is a refined adaptation of DSP, which applies varying degrees of reverberation and echo to enhance live ambience, providing a choice of six sound field settings: studio, jazz, club, concert, dome and stadium.

The DEH-P946 car CD player/receiver has an RRP of \$1599 and is available at Pioneer car audio dealers. For more information circle 146 on the reader service card or contact Pioneer Electronics Australia, 1 7 8 - 1 8 4

Boundary  
Road,  
Braeside  
3195.



## IR remote control for the future...

US firm Madrigal Audio Laboratories claims its IRIQ as the first true high-performance universal infra-red (IR) remote control. It was developed in conjunction with Harman International and Microsoft Corporation, the three forming a strategic partnership to create what they describe as a 'unique convergence product'.

Priced at US\$399, IRIQ combines a high-tech touchscreen panel with a selector wheel (for navigation) and five simple buttons, and is claimed finally to deliver what so many have promised: ease-of-use. This level of simplicity is achieved through activity-based operation,

which can be optimized via a PC connection.

IRIQ comes with an extensive library of IR commands already installed, allowing instant setup for most devices. For devices that don't appear in the database, it can learn their IR commands through conventional programming methods. Programming is also possible from a PC, where a special Windows-based programming tool can be used to make IRIQ even more powerful and/or simple to use. The software allows profiles to be created, saved and modified using the IRIQ CD-ROM included with the unit.

IRIQ is only available through specialist audio/video dealers. Another version called Take Control is available under the Harman Kardon and JBL brands.





# WHAT'S *new*

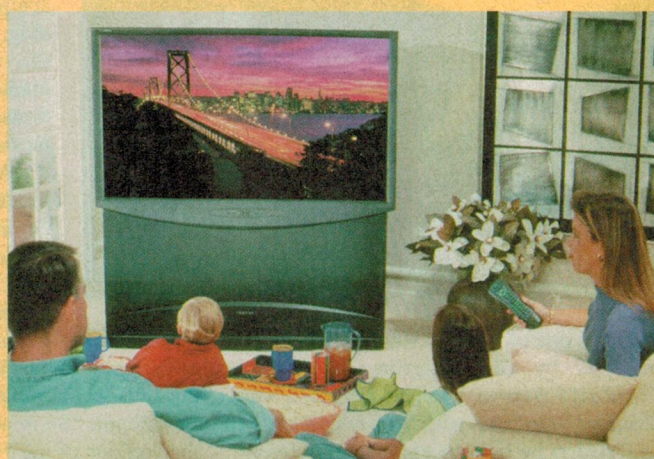
in the ever-changing world of electronics

## Decoders for digital HDTV now in production

With digital TV broadcasts now getting under way in the US, and HDTV 'coming soon', Thomson Consumer Electronics has begun production of its first HDTV-compatible decoder module, the RCA DTC100. RCA and ProScan HDTV receivers using the module are already being demonstrated at 'selected retail locations'.

The modules are made at Thomson's manufacturing plant in Juarez, Mexico, and then shipped to a Hitachi plant for incorporation into RCA, ProScan and Hitachi receivers. They'll also be sold in set-top boxes for use with existing analog receivers.

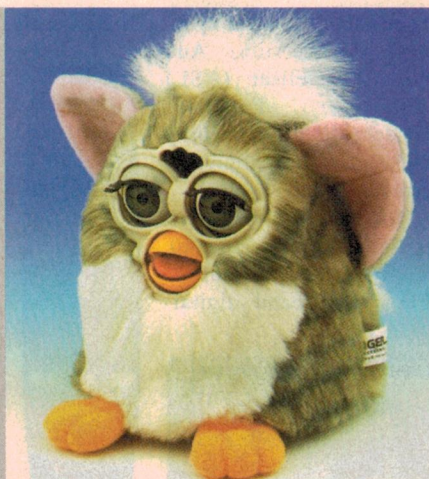
For consumers, the most striking difference between current generation analog TVs and the new digital HDTVs will be the 16:9 widescreen picture and an image resolution about five times better, plus Dolby Digital 5.1-channel audio.



## Furby, the latest animatronic pet

This Christmas many children in the USA will be receiving a new pet in their stockings: a cuddly 'animatronic' artificial pet called Furby, just released by Hasbro subsidiary Tiger Electronics. It's a standalone talking electronic toy, which initially speaks its own 'fantasy language' — Furbish — but can gradually be taught English.

The Furby interacts with the environment through sight, touch, hearing and



physical orientation. It comes with a vocabulary of over 200 Furbish and English words, and is able to 'say' more than 800 phrases.

Each Furby has its own specific personality, and can move, dance, sing, open and close its eyes, and wiggle its ears. Furbies can also communicate with each other via infra-red signals, and can catch one another's cold and start to 'sneeze'.

Priced at around US\$30, Furbies are expected to be the next craze for junior Americans. Ain't electronics wonderful?

## Digital camera also takes movies

Sanyo has introduced a new type of digital camera, the VPC-G250EX, offering features not available on other current models.



Pictures can be taken in one second and played back in half a second — called 'Quick take, Instant Replay'. The company says this high speed processing is made possible by its Solid State Video Camera (SSVC) chip.

The camera also has a Video Clip feature which allows you to take a five-second video clip that includes a sound track with a QVGA size picture.

The G250 uses a 350,000-pixel CCD image sensor with VGA (640x480) image size. Downloading pictures into a PC can be achieved using the cable and software provided, or using the SmartMedia card with the supplied Flash Path adaptor. There's also an AV output, so you can plug it straight into your TV or VCR. The camera uses four rechargeable nickel-metal hydride batteries, and these plus a charger are included with the camera.

Other features include auto focus, auto flash, exposure correction and the camera can automatically record a sequence of events at spaced intervals. The camera is compact and weighs just 200 grams. It retails for \$1299.00 and is available from camera stores and electrical appliance outlets. ♦



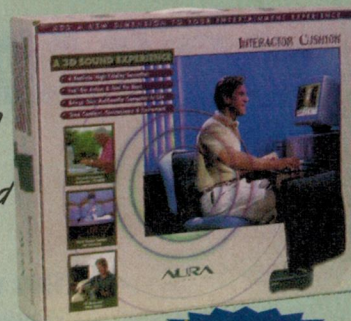
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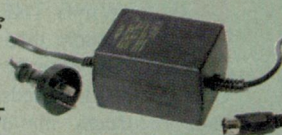


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## AURA SHAKER MOTOR ASSEMBLY

This unit is the device that delivers the low frequency information into the small of your back. It operates like a loud speaker in that it has a voice coil and magnet, but it doesn't have a cone. In its place is a heavy steel mass that transmits the jolt by the inertia of the mass. These units are very similar to those fitted in some really up-market movie theatres. Great for experimenters.

Specifications for the Subsonic Actuator: •Operating Frequency: Subsonic, Max force: 20 foot pounds, Nominal Force: 0.5 foot pounds per watt •Rated power: 18 watts continuous RMS. •Dimensions: 250(W)x300(H)mm •Weight: 1.5kgs



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# Marantz' CM635

## CD/MD Combination Player

**This month our reviewer Louis Challis has been evaluating the first CD player/Mini Disc recorder-player combination to reach our market — from Marantz, a sister company of Philips. He was most impressed with the measured performance, and his 'trained ears' group was equally impressed in their A-B listening comparisons...**

**F**OLLOWING THEIR INITIAL development more than 30 years ago, there have been literally billions of Compact Cassettes and hundreds of millions of compact recorders manufactured and sold worldwide. The latest generation of compact cassette recorders and players are infinitely better than previous recorders. The progressive hardware development and — equally important — improvements in tape format have lead us to the point at which relatively few people are capable of detecting or identifying the difference between a well recorded type II (chrome) or a type IV (metal format) compact cassette, and the source material.

The real problem with the compact cassette (and that included the Philips Digital Compact Cassette or 'DCC' format) is that they exhibit a fundamental ergonomic limitation. Because they're linear-access storage media, there can be a significant delay in accessing any desired point on the tape (say a different track), from wherever you may be. In contrast, if you're playing a CD or other 'random access' medium, you can generally access any track or section of your CD in under two seconds.

Ultimately the access time and convenience have become the most significant issue. I believe this is what became the real sticking point for the majority of potential DCC purchasers, and proved to be the 'last nail in DCC's coffin'.

Following the initial development of Mini Discs there were relatively few companies,

apart from the Sony and Sanyo Corporations, who believed that Mini Discs would ultimately replace conventional compact cassettes and become the preferred home recording medium. It is apparent that in the beginning, neither Philips International nor its sister company Marantz placed any credence in that view. However following the demise of DCC, that opinion would appear to have changed.

*"If you have any thoughts of purchasing an expensive car with a car stereo incorporating a Mini Disc player, then this is unquestionably an essential accessory to that purchase."*

More significantly, Mini Discs now appear to be the preferred format for many of the more expensive car stereos. Not only are Mini Discs more convenient to load into a car's stereo, but more critically they offer fidelity which is audibly comparable to the best car CD players. And Mini Disc recorders allow the user to pre-record their own specific collection of tracks, unlike CD players or their home derivatives.

Most quality top of the line Mini Disc recorders now provide additional features, of which one of the most attractive is their ability to display the disc and/or track titles — or

should you prefer it, the orchestra's, soloist's or musician's names. Whilst I note that CDs claim to offer comparable capabilities, relatively few discs have yet been encoded with that information. Sadly, even fewer CD players provide the wherewithal to display the information.

Following their initial release six years ago, I have reviewed a number of Mini Disc recorders. Each successive generation has outperformed the previous generation, and the most recent MD recorders provide outputs which when you compare the original material with the MD copy, make it difficult for even trained ears to tell the difference. The attributes of the Mini Disc system are by now so obvious that even their most outspoken original detractors are quietly joining the line to review the manufacturing licensing rights and related conditions.

### First CD-MD combo

WITH THE SOLE exception of car stereo decks, previous MD players and recorders which arrived in this country only offered a single-medium capability — i.e., playing or recording Mini Discs. None of those products provided a built-in capability of playing or direct dubbing from a CD (excluding, of course, an outboard CD player). Following our review earlier this year of the Pioneer PDR-04 CD recorder which facilitates copying either individual tracks or more commonly an entire CD, it was obvious that the market was ready for a CD-MD



recorder offering comparable capabilities.

The Marantz CM635 is the first combo deck which fulfils that specific role. More importantly, it offers the convenience of one-button recording, so that you can copy (dub) an entire CD onto a blank Mini Disc with unbelievable ease, and with an assurance of perfect copying every time.

The frontal appearance of the Marantz CM635 bears a striking similarity to a number of other recent Marantz releases. The front panel is black, the buttons are black, and only the large Marantz logo and lettering under the buttons are gold. The front panel incorporates two separate slots, one for the CD tray which slides out on demand, and a smaller slot for the Mini Disc. A central fluorescent alphanumeric display in striking blue (which is both legible and readable at two metres) identifies the state of play and other critical numerical data.

Although many of the most important controls are provided on the front panel, the ubiquitous remote control provides far more flexibility — plus a number of functional controls which are either not accessible or are more difficult to access via the front panel's simplified controls.

The handbook (or what Marantz describes as a User Guide) is a relatively thick tome, which encompasses nine different lan-

guages. The English section is at the very front, and encompasses the first 21 pages. The description and instructions relating to the CM635's interconnections, and specifically how to play CDs or Mini Discs, are dealt with in a simple and straightforward manner in the first 11 pages.

The next 20 pages are far more complex, as they cover a multitude of alternative recording, track transposition and disc titling procedures — which are neither simple nor necessarily straightforward until you practice them. As you delve further you discover that the User Guide also gives comprehensive advice on the straightforward copying of a CD to a Mini Disc, and more complex options involving dubbing, dividing, combining and track naming that more dedicated purchasers may wish to perform.

Surprisingly though, the User Guide does not contain a specification. Scan Audio's brochure, which describes the current range of Marantz products being marketed in Australia, provides little more information. It does not provide what I would have liked to have been offered by way of comprehensive technical information. Whilst Marantz describes the frequency response as being '20Hz-20kHz', that's sufficiently vague that it gives only a hint of the recorder's performance.

## Lab testing

IT WAS OBVIOUS that I should resolve this question for a start, so I took the CM635 combination player into the laboratory and proceeded 'to put it through its paces'. I was pleased to discover that the frequency response and virtually all of the other performance parameters for both the CD player and Mini Disc recorder sections were significantly better than I would have expected.

The CD player's frequency response is effectively  $\pm 1$ dB from 6Hz to 20kHz, which is considerably better than you might have anticipated from the manufacturer's abbreviated specification. The Mini Disc player's record to replay, as well as its replay frequency response, are within  $\pm 1$ dB from 8Hz-20kHz, which is also somewhat better than you might have expected. The -3dB low frequency response is just under 4Hz, which offers a remarkable overall bandwidth capability.

The Mini Disc's record to replay frequency response, when recording from a CD, is also 8Hz-20kHz  $\pm 1$ dB. The advantage of that broad frequency response is that you retain the full spectral bandwidth and more critically the full dynamic bandwidth of better than 94dB, from an original 96dB theoretical bandwidth on the CD from which you are copying.

There are of course other equally impor-



*No larger than many CD players, the CM635 combines a high quality CD player with a Mini Disc recorder/player capable of equally high quality. This provides the ability to make MD copies of your favourite CD tracks, easily and with results that are virtually indistinguishable from the originals...*



## The Challis Report

tant parameters, including replay linearity, signal to noise ratio, total harmonic distortion and channel separation. I evaluated these, and without exception, they all proved to be equally impressive.

The replay linearity does not display any significant drift until the input signal levels drop below -60dB. Even then, the measurable drift does not exceed 0.5dB at the -90dB level. The measured signal to noise ratio was a genuine -96dB (1dB better than claimed), whilst the total harmonic distortion did not become a significant issue until signal levels dropped to below -80dB. Channel separation was better than -90dB at maximum signal level, right across the spectrum.

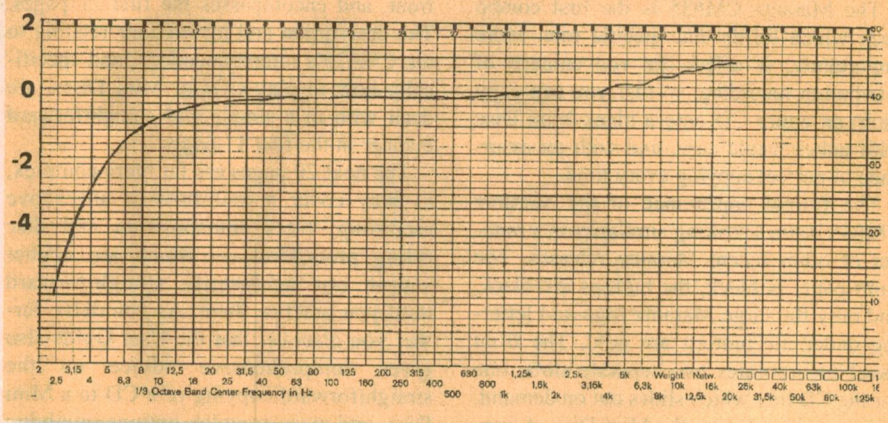
In short, I was unable to fault either the CD player's objective performance, or the Mini Disc recorder's replay performance.

### Listening test

FOR ITS SUBJECTIVE assessment, I took the Marantz CM635 home and proceeded to put it through its paces. Initially this was with a number of pre-recorded Mini Discs which I had purchased in America, and I was gratified by the outstanding fidelity achieved. I then proceeded to evaluate a number of test discs which Sony Australia provided for that purpose, as well as two test discs which I had previously prepared for just such a situation. The performance again was faultless — even the 'fade to noise' tests produced extremely good results.

My last series of evaluations involved recording two CDs which provided complex transient test material, which evaluates the record to replay process of the Mini Disc player — which can then be assessed in a direct 'A-B' subjective evaluation.

The CDs I used for this test were *Pictures*



A plot of the low end response of the MD player in the CM635. Louis measured the overall record-play response for the MD section as 8Hz - 20kHz +/-1dB.

## Marantz CM635 MD/CD Combination

A high performance CD player and Mini Disc recorder/player combination. Dimensions are 439 x 339 x 93mm (W x D x H), with a weight of 5kg

**Good points:** Excellent audio performance, from both the CD and MD sections; makes it very easy to make MD copies from CDs, for listening in a car MD player.

**Bad points:** Nothing significant, but the User Guide gives no performance specification.

**RRP:** \$1699

**Available:** Scan Audio, 52 Crown Street, Richmond 3121. Phone (03) 9429 2199.

of the *Floating World* played by Yolanda Kondonassis on the harp (TELARC CD-80488), and Ignacy Jan Paderewski playing various Chopin's polonaises, waltz, mazurkas and etudes (Nimbus NI 8816). The second of these discs is quite novel, as it is a DDD recording of a man who has been dead for more than 57 years.

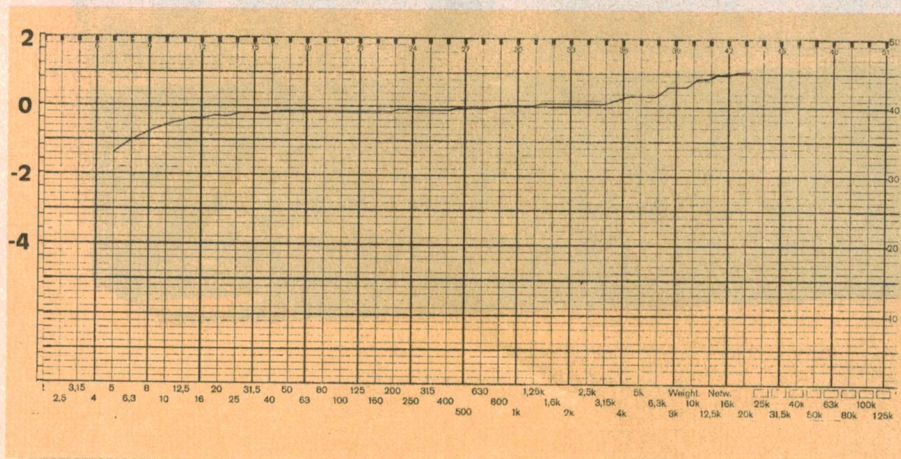
Even stranger, the music that I listened to was digitally recorded on a Duo-Arts recording piano during the period 1919-1927. The paper rolls on which Paderewski faithfully recorded his original recitals, have been cleverly transcribed by means of a modern reproducing piano, to recreate his original recitals with an unmatched fidelity and integrity. This really was exciting stuff!

I acknowledge that there are other famous pianists whose recordings have exhibited superior skills to Paderewski's on this disc, but not withstanding, Paderewski's masterful performance is still a hard act to follow.

Although my listening panel and I doubted our ability to choose the difference between the original CDs and the copies, we carried out our comparisons all the same using conventional A-B testing between a Sony CD player and the Marantz CM635 for replaying the recorded Mini Discs. And I can report that my listening panel of musicians and other trained listeners could find **no identifiable difference** in quality.

### Summary

THE MARANTZ CM635 CD/MD player is an exciting and potent piece of hardware. If you have any thoughts of purchasing an expensive car with a car stereo incorporating a Mini Disc player, then this is unquestionably an essential accessory to that purchase. Even if you do not purchase such a car, or even a car stereo with MD player, the CM635 is still worthy of consideration to fulfil a major role in your home high fidelity system's basic requirements. ♦



Here's the low-end response of the CD player section, for comparison. Overall this measured as 6Hz - 20kHz, +/-1dB.



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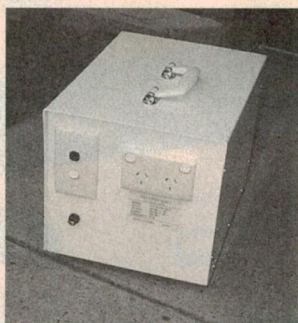


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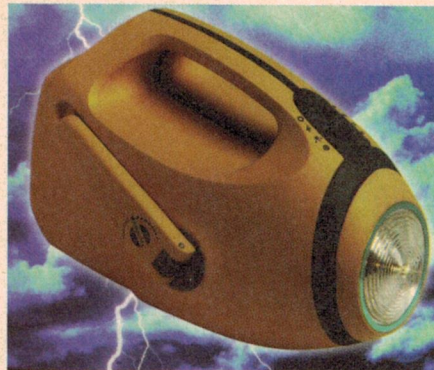
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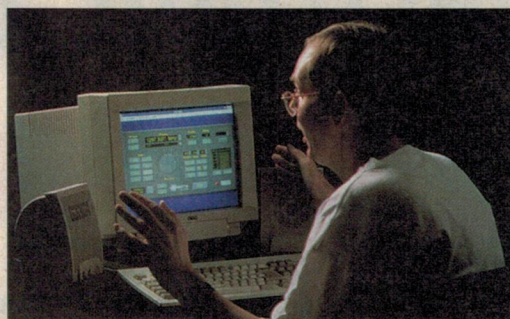
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# Electronic Books

## Go For Liftoff!

**It finally looks as if electronic books will hit the market, this year and in time for Christmas — at least in the USA. But will they end up replacing traditional books printed on slices of dead tree? At present that still remains to be seen...**

**by Jim Rowe**

**F**OR QUITE A FEW years now — at least since the first portable computers appeared — electronic books have been 'just around the corner'. And indeed most of the necessary technology (like LCD panels, memory chips and low power microprocessors) seems to have been available for a while, although not necessarily at an attractively low price.

But somehow e-books haven't *quite* made it to market, at least until now. They've been a bit like a new aircraft, which has been trundling along the taxiways but never quite getting the chance to turn into the main runway and have a serious try at taking off.

Now though, the time finally seems to have arrived for electronic books to have their shot at success. One US firm has just released its model, while a second expects to have a model on the market before Christmas and a third expects to have one available in January. Perhaps 1998-9 will turn out to be the dawn of electronic book publishing, just as 1997-8 proved to be the time when digital still cameras finally 'went critical'.

First of all though, what exactly *is* an electronic book? Well, it's essentially an electronic replacement for a traditional book printed on paper, using electronic storage and display of the information and with everything packaged in a compact physical form, intended to make it as portable and as convenient to access as a traditional book.

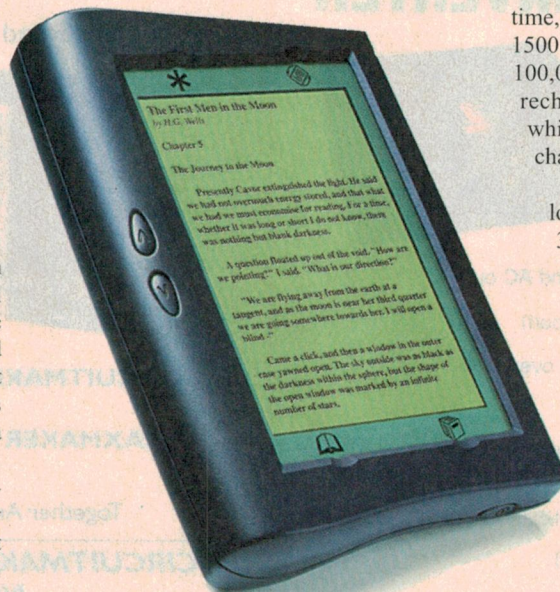
Most media seers have predicted that e-books will have a liquid-crystal display (LCD) screen, with a display resolution at least equal to that of a standard printed A5 book page, and a brightness/contrast such that it can be read easily in a brightly lit room — or even in sunlight. Ideally it will also have inbuilt backlighting, to allow 'reading in bed' without disturbing others...

To store the actual information, various media have been proposed — including

floppy disks, miniature hard drives and CD-ROM discs. However it looks as if the first products on the market are going for 'no moving parts' solid state memory chips, probably of the 'Flash RAM' type so they can hold the stored material even when the power is turned off.

How do you get the information into the e-book's memory? With the models just hitting the market it's by downloading via the Internet, either directly or using a Net-connected PC as the local 'filling station'.

But enough of this background; you probably get the general idea, so let's look at the new models themselves.



**NuvoMedia's Rocket eBook, slated for release on the US market before Christmas at about US\$500. It's about the same size as a conventional paperback book, with a memory holding 4000 pages of text and graphics.**

### The Softbook

DEVELOPED BY SoftBook Press Inc., a firm in Menlo Park, California, the SoftBook measures 216 x 280mm and weighs around 1.3kg — about the size and weight of a traditional coffee-table book, and with a display area roughly the same as a single page of such a book. It has a durable plastic case and comes with a soft leather protective cover, to safeguard it against the likely rigours of travel. The SoftBook is 'turned on' merely by opening the leather cover.

The black-and-white LCD screen is backlit, and has sufficient display resolution to allow clear display of text, graphics and pictures. It's designed to display one page at a time, and the internal memory stores a basic 1500 pages — optionally expandable to 100,000 pages of text. Power comes from a rechargeable lithium-ion battery pack, which gives up to five hours of reading per charge (which takes one hour).

SoftBook's content is directly downloaded via the Internet, using its inbuilt 33.6kb/s modem. The unit automatically dials up and connects to the company's Softbook Network, as soon as you plug it into a standard telephone socket (at least in the USA). Once the user is 'online', they can use the SoftBook to browse the book and magazine titles available in electronic format, from the company's SoftBookstore. They can then purchase their next title, and download it into the SoftBook's memory, at a rate of about 100 pages/minute. (The content is encrypted, for security of copyright.)

SoftBook provides a facility allowing the user to annotate their copy of a book's content with personal notes. They can also add highlighting and private bookmarks, and customise the book's content in terms of display fonts, etc.



All of this customisation can then be saved and uploaded to the user's 'online personal bookshelf', for subsequent retrieval at a later time...

SoftBook Press has entered into publishing agreements with a number of existing book publishers, including Random House, HarperCollins and Simon & Schuster. They have also developed a SoftBook Publishing Toolkit, to allow publishers to convert titles to the SoftBook electronic format while maintaining full copyright protection.

The SoftBook itself is being sold for US\$299, but as part of the marketing deal users must sign up for a kind of 'book club' scheme with a monthly fee of US\$9.95. This provides access to a variety of books and periodicals, unlimited 'online bookshelf' space, free software updates and 24-hour access to the SoftBook Network and SoftBookstore.

## The Rocket eBook

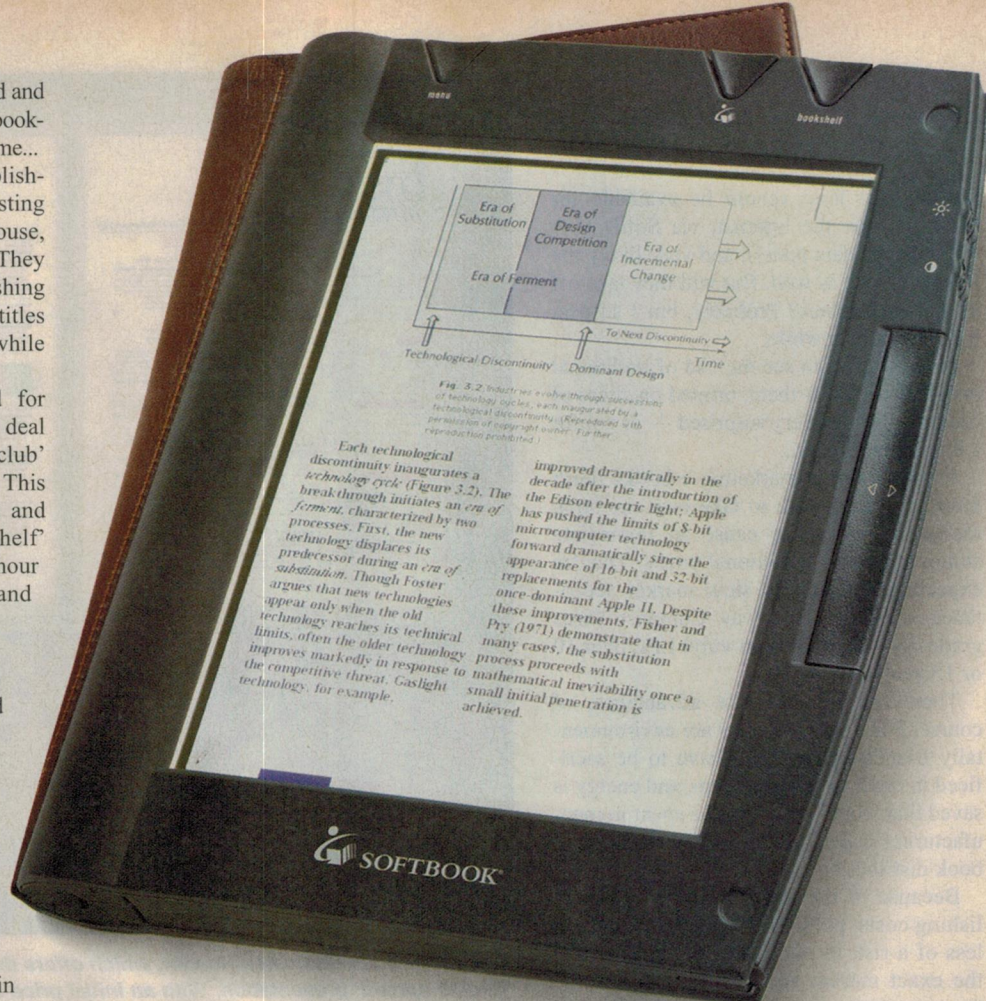
NOT FAR BEHIND the SoftBook, and with its release expected before Christmas, is the Rocket eBook — developed by NuvoMedia Inc., of Palo Alto in California. At the time of writing there's not as much information available about the eBook, but it's described as being 'about the same size as a paperback book' (roughly 127 x 178mm), and weighing around 568 grams. The LCD screen, which again has backlighting, appears to offer roughly the same display area as an A5 page.

The capacity of Rocket eBook's internal memory is quoted as 'at least 4000 pages of text and graphics', and the battery life as 20-25 hours — or up to 40 hours when the backlighting is not used. The battery is again rechargeable, and can be fully recharged in 90 minutes.

The Rocket eBook has no internal modem, but communicates with the Internet via a standard desktop or laptop PC, using the supplied eBook Cradle — which also interfaces with the eBook for battery charging. The Cradle connects to a plugpack supply for charging, and also to the PC via a standard RS-232C serial port. The Rocket eBook's Win95/NT4 compatible software integrates with the user's normal Web Browser to facilitate downloading of books from NuvoMedia's website. (In fact the eBook's internal software can even be upgraded online.)

Like the SoftBook, the Rocket eBook apparently allows the user to customise books in terms of display font, bookmarks and adding annotations. However it's not clear whether this customisation can be saved for re-use at a later time, or only applies while that title is in memory.

The expected price for the Rocket eBook is around US\$500. It was apparently designed by the same team which produced



the 3Com/US Robotics PalmPilot handheld PC. Manufacturer NuvoMedia is reported to have signed an agreement with publisher Barnes & Noble, to offer around 1000 titles for downloading by the end of the year.

## EB's Dedicated Reader

BY EARLY NEXT year, a third electronic book is expected to have been released on the US market. This is the EB Dedicated Reader, from Everybook Inc., of Middletown in Pennsylvania.

As yet there's not a great deal of information available about the EB Dedicated Reader, but the 'Professional' unit slated for release in January appears to be larger than the other two (around 300 x 248 x 48mm) and with a weight of about 1.7kg. It seems to have a dual-screen two page display, unlike the other units, and also provides colour display rather than the monochrome provided on the SoftBook and Rocket. However it also looks like being rather more expensive, at around US\$1500.

Based on an AMD Elan SC400 CPU running at 100MHz, the Dedicated Reader Pro has two full colour passive-matrix LCD screens offering XGA (1024 x 768) resolution. It has 4MB of Flash RAM, 16MB of

**The SoftBook, which is about the size of a coffee-table book. The inbuilt modem allows it to download titles directly from the company's SoftBookstore.**

DRAM and an inbuilt micro hard disk drive of 540MB - 2.1GB capacity — described as storing around 500,000 colour pages. The battery life is apparently around 4-6 hours.

Like the SoftBook, the EB Dedicated Reader has an inbuilt modem (in this case a 56kb/s PCMCIA Type II) and can dial the company's online bookstore merely by plugging it into a touch-tone phone socket. Downloading can be immediately after credit-card purchase, or deferred until the middle of the night for lower rates. (The Dedicated Reader can be programmed to dial up and download automatically.)

A slimmer Student version of the EB Dedicated Reader is slated for release very late in 1999, for around US\$1000, and a Personal version for around \$500 by September 2000. The latter is expected to be smaller, with a size of around 230 x 150 x 25mm.

## Will they fly?

SO THERE'S FINALLY some real products emerging in the long-awaited electronic book market; by the time you read this, the



SoftBook at least should be available for purchase over the Internet, via SoftBook's website (see data panel), and very likely the Rocket eBook as well. But will they take off in the marketplace? Probably, but I suspect it'll take quite a while.

Are we about to see the end of traditional books as we know them, printed on slices of dead tree? I'll be very surprised — or not for a long time, if ever...

Even the firms marketing e-books don't seem to expect them to take over the book market by storm, or cause an immediate slump in sales of traditional books. They're expecting a relatively slow market acceptance, a bit like the way Compact Discs gradually took over from vinyl LPs, over 10 or 15 years.

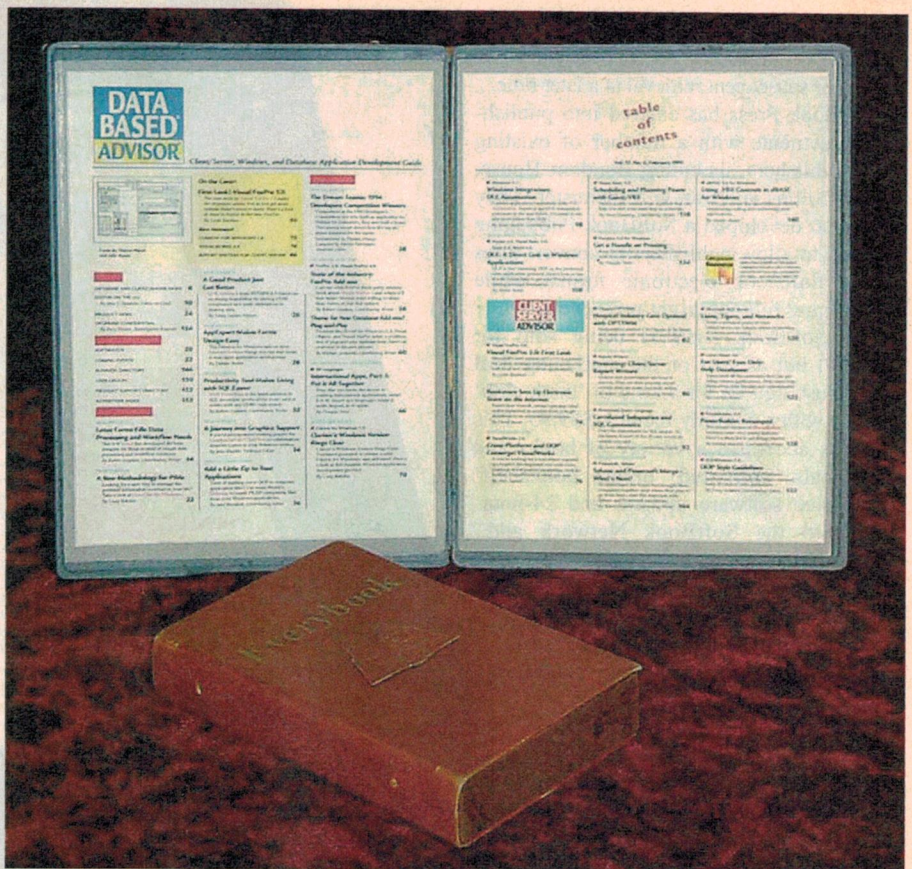
There are quite a few advantages, of course. For a start, e-books are environmentally friendly; trees don't have to be sacrificed in order to produce them, and energy is saved that would otherwise be spent in manufacturing paper, printing and binding, and book distribution.

Because of the lower printing and publishing costs, publishers will also be taking less of a risk in publishing e-books where the exact market and likely sales volume for a new title or author are unclear. In fact some publishers have already announced plans to use electronic publishing for trial marketing of new titles, with the idea that they'll then proceed to release 'hard copy' paper editions of titles that prove successful in e-book form.

Even the end user seems likely to benefit, as the projected cost of buying books in electronic form seems to be significantly lower than existing paper-based books. Considering the staggering price of many textbooks nowadays, this is likely to make e-book versions quite attractive — especially for impecunious students.

All the same, many traditional 'book lovers' don't seem to find electronic books appealing. They say they find the concept of a 'portable reading tool' somewhat cold and clinical, and miss the feel and smell of a familiar bound book.

Of course with e-books you never actually get any specific title in permanent physical form, either. Even if you get a permanent copy of the content, in some form, they're all ultimately read by loading them into the same physical reader. And will that be still operational, 10 years



**Everybook's EB Dedicated Reader, which offers dual colour LCD screens for a true 'double spread' presentation. With an initial price of US\$1500, it's slated for release there in January. It too has an internal modem for downloading, as well as a hard disk for storing your titles.**

## E-book Manufacturers

If you'd like to find out more about the new electronic books, here's the contact information for the three US manufacturers mentioned in this article:

### SoftBook Press

1075 Curtis Street, Menlo Park, CA 94025.  
Phone (650) 463 1800, fax (650) 462 0992.  
URL: <http://www.softbook.com>  
email: [info@softbook.com](mailto:info@softbook.com)

### NuvoMedia Inc.

745 Emerson Street, Palo Alto CA 94301.  
Phone (650) 327 5110, fax (650) 327 5112.  
URL: <http://www.nuvmmedia.com>

### Everybook Inc.

Twelve Oaks Center, 1801 Oberlin Road, Middletown PA 17057.  
Phone (717) 939 3995, fax (717) 939 4617.  
URL: <http://www.everybk.com>  
email: [info@everybk.com](mailto:info@everybk.com)

down the track? E-books could end up like cylinder records or reel-to-reel tapes, with a problem in reading them many years after purchase. That's one objective potential disadvantage, compared with traditional paperbound books...

So electronic books might indeed take quite a while to establish a solid market. My

guess is that they'll gain a toe-hold first in the textbook area, where existing books tend to be very expensive and users are more concerned with content than physical form. Then as prices fall, they'll perhaps begin competing with traditional 'paperback' books, which have always been the low-cost medium for content-rather-than-form popular publishing.

Frankly I doubt whether e-books will ever *totally* replace traditional 'hard cover' books, because these are sold as much for their familiar and reassuring physical form as the actual content. But then, the market for this type of book has been steadily shrinking over the years anyway, for various reasons.

I imagine the manufacturers and publishers backing e-books will be delighted if they can capture a reasonable slice of the much larger textbook and paperback market, over the next few years. And I have a feeling that this might easily happen. It's going to be an interesting market to watch, isn't it? ♦





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Getting some advice from

# The Experts in Sound Preservation

Soon after getting interested in making digital copies of his old analog recordings, EA editor Jim Rowe realised that there was rather more to it than simply hooking up the right high-tech hardware and software. So he sought some advice from experts at the National Film and Sound Archive, in Canberra...

by Jim Rowe

I GUESS MOST readers of *EA* would be at least aware of the existence of the National Film and Sound Archive (NFSA) — I've written about it three times myself in the past, twice back in the late 1970s when it was part of the National Library, and more recently in April 1994 ('Preserving Australia's Audio-Visual Heritage') when it was celebrating 10 years of operation as a separate entity.

Based in Canberra, the NFSA has a 'mission statement' which reads: *To increase knowledge, appreciation, use and enjoyment of Australia's moving image and recorded sound heritage by acquiring, preserving and providing access to a national collection of film, television, video, radio and recorded sound materials.* And over the 14 years since it was set up as an independent body by the

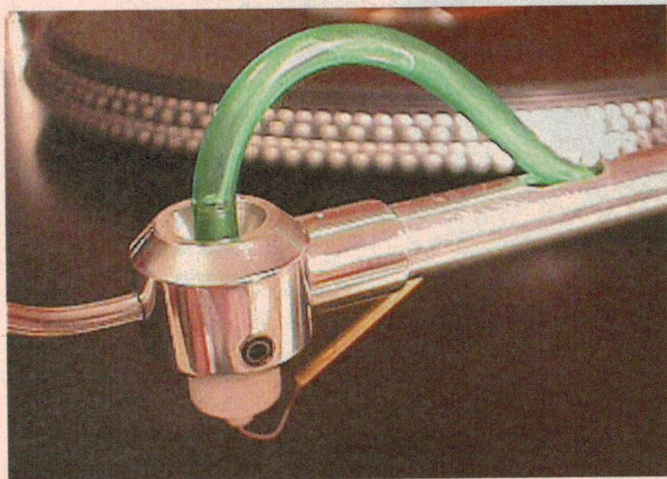
Hawke Government, despite ongoing budgetary constraints the NFSA seems to have achieved quite a lot in working towards those goals.

In terms of sheer size, the NFSA collections are now pretty staggering. Three years ago, it had around a million sound and film 'carriers' (i.e., media items like reels of film, rolls of videotape, video cassettes and sound recordings on cylinders, discs, CDs and tapes), and another million items of documentation — and they've continued to grow, despite efforts to cull out or 'deselect' duplicate items and others judged as 'international content only'. The deselected items are generally sold off, either directly or by a tendering process.

Quite apart from its impressive collection size, though, the NFSA has continued to

develop its reputation as a world leader in the preservation of both the contents and carriers of image and sound records. In fact they're acknowledged as being at the forefront of preservation technology and management in South-East Asia, and one of the world's leading archives.

They've also made big strides in making their collections more accessible to people, and indeed in making historic Australian audio and audio-visual software available to the public. For example they now have an impressive range of CDs, compact cassettes and video cassettes available both via their shops and by mail order, with material as diverse as early Australian radio programmes and serials, collections of songs from early Australian singers, and notable Australian feature films, documentaries and



The disc cleaning machine shown here isn't actually the NFSA's disc cleaning machine, but theirs is very similar (an earlier model?). It's actually the latest version of the famous Keith Monks Record Cleaning Machine, as used by record archives and really serious record collectors around the world. (You can find more about it on the web at [www.audio-restoration.com/monks5.htm](http://www.audio-restoration.com/monks5.htm)) A piece of cotton thread acts as a kind of "soft needle", while the vacuum nozzle sucks up cleaning fluid and dirt.





**NFSA disc preservation officer Mark Hogan at one of the turntables in the disc replay studio. He's using the stereo inspection microscope, and just behind the pickup arm you can see a case with some of the collection of different pickup styli.**

newsreels (going right back to the early silent-movie era).

OK, so the NFSA is doing a great job, and has all sorts of interesting and historic goodies available, for both historians and the rest of us. But why another article about them, at this particular time? Well, it all stemmed from a personal project of mine.

Like many of *EA*'s readers, I've had a long-time interest in hifi and sound recording — and hence I've gradually accumulated quite a few old records, tapes and cassettes. Soon after I acquired a CD-R Writer for my home PC earlier this year, I realised that with the right software and hardware, it could also be used to make digital copies of many of these old recordings.

The more I looked into this, and began experimenting, the more interesting it became. It turns out that there's a surprising amount of powerful DSP-based software available, to help you in making digital copies of your old analog recordings, in 'cleaning them up' by removing clicks and other noises, and in then writing the resulting digital WAV files to CD-R discs, to produce your own CDs.

But I also made another discovery: that there's more to all of this than you might

think. For example although the fancy DSP software can perform all kinds of impressive tricks to clean up a recording, some of those tricks can take a fair bit of time and effort on your part too, if you want the best result. And the fact is that you can often avoid the need to perform so many of these tricks, simply by putting a bit more effort into cleaning the record or tape in the first place, and achieving the best-possible transfer into the PC.

But what *is* the most effective (and safe) way to clean records — vinyl LPs and 45s as well as old 78s? And *can* you clean tapes?

It was questions like these that started to emerge, and I realised that it might be a good idea to try asking the experts at NFSA, who have been doing these things professionally for many years — and built up a huge amount of expertise. Much of it is perhaps a bit more specialised than most of us need to know, like how to rescue the recordings on crazed and flaking examples of the old lacquered metal transcription discs used to record radio programmes in the 1930s and 40s, but they've also learned the hard way how to perform all of the basics.

When I asked the people at NFSA if they'd be prepared to pass on a little of their knowledge, the response was swift and posi-

tive. They didn't actually have any 'How to do the Basics' literature available at this stage, explained Sound Preservation Section manager Wanda Lazar, but if I'd like to pay them a visit, they'd be happy to answer any questions and show how it's done.

Needless to say I jumped at the chance, especially as it would give me the opportunity to pass on the 'good oil' to any *EA* readers starting to get interested in this satisfying field. And from the response we've received already to my little 'Audio Recording Front End for PCs' project in the September issue, I suspect there are already quite a few of these...

## Disc recordings

SO, WHAT did I actually learn? Well, the first section we visited was that devoted to cleaning and playing disc recordings. Here disc preservation officer Mark Hogan demonstrated the way they use an ultrasonic cleaning tank to remove much of the grime and 'muck' from really dirty discs. The fluid used for this cleaning is de-ionised water, into which is dissolved a small amount of a fungicide called Cetrimide (which is available through larger pharmacies, by the way).

This technique can apparently be used on just about any disc, except those that are too



## Sound Preservation

fragile (like crazed and flaking lacquer-on-metal discs) or made using materials which would dissolve in water, like the old gelatin-on-glass records.

The discs are carefully dried after cleaning, but apparently a faint trace of the Cetrimide remains on the surface and acts as a weakly conductive anti-static agent. This seems to be quite effective in preventing dust particles from being attracted to the disc again, undoing the good work (something I've already discovered myself).

How about discs with really stubborn unwanted coatings? Here Mark and his colleagues use a special 'cleaning turntable', with a custom-made 'pickup arm' and a tiny suction nozzle instead of a needle, connected to a vacuum pump. A cotton thread acts as a 'soft needle', gently guiding the nozzle so that it follows the record groove without causing any damage. The operator can stop the turntable, apply cleaning solution to the problem areas with a small brush, and then use the 'vacuum pickup' to remove the debris and dry the disc surface.

The weak Cetrimide solution can again be used here, but Mark Hogan explained that in really stubborn cases they also use plant-derived solvents like eucalyptus oil or even tea-tree oil. But no mineral-based solvents, because they can attack the disc materials.

By the way Mark said that distilled water can be used instead of de-ionised water, so that we amateurs should be able to achieve quite good disc cleaning using a weak solution (say 1%) of Cetrimide in distilled water, followed by a rinse with distilled water alone.

### Disc playing tips

ON A PREVIOUS visit to the NFSA, I remember seeing a large range of different pickup stylus, which allow Mark Hogan to select the one which gives the best replay quality for each old record — partly by trial and error, and partly from his knowledge of the size and shape of cutting stylus which were used in each era and by each record manufacturer. There are conical and elliptical stylus of various sizes and shapes — even 'twin peak' types, used to play record stampers (which have undulating 'hills' rather than 'grooves'), or discs where the bottom of the groove is very worn, but the upper sides are still OK.

Other nice NFSA facilities which Mark demonstrated are the modified professional turntables with their range of tone arms to

suit the different sized discs, and variable speed drives allowing playback at the speed a disc was recorded — or perhaps a submultiple, if this gives better results. They can even play discs backwards, to see if this gives a cleaner output (speeding up and/or reversing the recording later, digitally).

The NFSA turntables even have an impressive binocular microscope, which allows you to make a detailed inspection of groove damage, cracks and surface crazing.

All of this is great for the NFSA profes-

***"Similarly it can pay to use a stereo cartridge even with mono discs — as one side of the groove can be worn less than the other..."***

sionals, of course, but what about we amateurs with more limited facilities — were there any tips that Mark could offer us? There were, as it happens.

One was that if you *do* have a choice of stylus, it's well worth experimenting with them. Some discs may have become worn in a particular part of the groove, and a stylus of larger or smaller diameter might be able to give a cleaner result by contacting relatively unworn parts of the groove.

Similarly it can pay to use a stereo cartridge even with mono discs, and compare

deterioration. Generally they should be stored vertically, with reasonably close spacing so they can't lean over and risk warping. Ideally the original inner sleeves should be replaced with acid-free paper sleeves, or thin milky-coloured plastic sleeves like freezer bag material. The thicker clear plastic sleeves have plasticisers and fillers that can adversely react with the disc materials.

### Tape recordings

FROM THE DISC area we moved to the tape preservation studio, where Viktor Fumic demonstrated some of the facilities and techniques he uses to retrieve the best signals from old tapes.

Magnetic tapes don't seem to get as 'dirty' and worn as old discs, and hence to need as much cleaning. Often a quick vacuum to remove dust seems to be all that's needed.

However a nasty problem with some old tapes is hydrolysis, where the binder used to attach the magnetic particles to the plastic tape substrate has begun to absorb moisture, and become 'goosey'. This can cause the magnetic layer to come away from the tape, making it unplayable and effectively useless.

With tapes that aren't too far gone, the NFSA can bake them for a time in a controlled-temperature vacuum chamber, to remove as much moisture as possible and hopefully allow at least one playing. But this isn't likely to be much of an option for we amateurs, so the best advice Vik could give is to store your old tapes in as dry a place as possible, and subjected to a minimum of temperature variations. They should also be wound moderately tightly on the spool — with their outer ends securely taped down, to prevent spontaneous unwinding. And away from magnetic fields, of course!

Apart from that, it's a good idea to rewind tapes periodically (in a clean and dry place), to give them an airing.

The NFSA tape studio has a number of professional recorders to replay the tapes, most of them chosen for their speed stability and range of facilities for accurate equalisation. One recorder is especially suitable for old and fragile tapes, because almost every surface with which the tape comes into contact is rotating — either passively or driven. So apart from the replay head itself, there's a minimum of 'rubbing' contacts to cause tape stress and wear.

Perhaps the lesson here for we amateurs is



**The vacuum chamber used for higher temperature, low humidity rejuvenation of magnetic tapes. The tapes are wound 'interleaved' on 14" spools.**

the signals from the two channels. One signal may well be cleaner and less distorted than the other, as one side of the groove can be worn less than the other...

(With suitable wiring a stereo cartridge can also be used to play old 'hill and dale' recordings, too.)

Incidentally I asked Mark for tips on the best way to store old recordings, to minimise



that if you have a choice of old tape decks to use for your tape transfers, choose the best one you can, with guide rollers instead of fixed posts wherever possible. You might also want to try removing unwanted erase and record heads, leaving just the replay head. (Although be careful here: some of those extra heads might play a secondary role in damping tape vibrations.)

## The editing suite

THE OTHER MAIN area we visited was one of the NFSA's editing suites, where Cathy Bromley and her colleagues spend their time piecing together and restoring the old recordings that have been retrieved from disc and tape, using their digital workstations. The workstations they use are essentially an up-market professional version of the PC-plus-WAV file editing/DSP software that you or I are able to use, augmented by a range of graphic equalisers and other traditional analog 'hardware' filtering.

The digital side of the systems is the Sonic Solutions' No Noise suite of sound editing and DSP software, running on Macintosh computers. This is a very powerful and flexible system, which has been steadily upgraded and enhanced over a period of years.

Because each digital sound editing system is different, there didn't seem to be a great deal of specific advice that Cathy Bromley could offer to amateurs. However she did note that a good deal of patience is often required, when you're trying to remove the clicks and other types of spurious noises from a recording. Although experience obviously helps, it can still take a fair amount of experimenting to find the best threshold level settings for the software's de-clicking and noise filtering algorithms, to suit any particular recording. This probably applies with almost any of the different systems. (It certainly does with those I've tried.)

Cathy also confirmed that although DSP filtering and de-clicking can perform wonders (especially in experienced hands), it's still very important to strive for the best possible replay of the analog source material.

By the way, a 'golden rule' at the NFSA is that the 'raw' source file is always kept unmodified (along with the original disc or tape, of course), as a reference. That way, you can always 'have another go' if your attempts at cleaning it up come to grief, or if improved and more powerful software becomes available in the future. In principle it's a rule that would be just as desirable for we amateurs, of course.

The NFSA seems to use DAT tapes as its medium for intermediate digital transfer and storage, but this is probably not a feasible approach for amateurs. However now that blank CD-R discs are very affordable (less than \$3, if you shop around), you might be able to keep copies of your 'raw' digital



*Tape preservation officer Viktor Fumic in the NFSA's tape studio, with one of the professional tape decks — a Studer A820 1/4" machine, the only tape machine capable of playing severely hydrolysed and fragile audio tapes.*

recordings on CD-Rs, as well as using them for your final 'cleaned up' versions.

## Pool of knowledge

PROBABLY THE BEST additional advice I was given by Wanda Lazar and her colleagues at the NFSA sound preservation section, and also by the NFSA's deputy director Ray Edmondson, was that anyone interested in this area would benefit by joining the Australasian Sound Recordings Association (ASRA).

Formed 10 years ago, the ASRA is made up of private collectors, music industry professionals, professional archivists, radio broadcasters, social historians and others — in fact anyone with a strong interest and involvement in our sound recording history, its developments, its arts and its preservation. It publishes a twice-yearly journal called *The Australasian Sound Archive*, which is received by all members as part of their membership — which currently costs \$30 annually, for private members.

So if you're interested in sound preservation, you might consider joining ASRA for a start. Applications should be sent to Bruce Skilton the ASRA Treasurer/Public Officer, at 1 Lloyd Place, Kambah ACT 2902.

## A final plug

I FOUND my latest visit to the National Film and Sound Archive very interesting, and managed to pick up quite a few good practical tips about sound preservation. Hopefully this article will help you in this

regard as well.

My grateful thanks to Ray Edmondson, Wanda Lazar and their colleagues at the NFSA, for sharing their knowledge and expertise and making this article possible.

Before I end up, though, I'd like to make a suggestion. Many of the audio cassettes, CDs and video cassettes available from the Archive Shop are not only interesting and entertaining — especially for anyone with an interest in A-V history — but also excellent examples of just what can be achieved, in terms of sound and image preservation and restoration. So you might like to consider buying a few, if only to provide a reference and inspiration for your own activities. You'll also be helping the NFSA to boost its coffers and resources.

You can get an idea of the range of products available from the NFSA from its web site, at [www.archivenet.gov.au/nfsa/nfsa.htm](http://www.archivenet.gov.au/nfsa/nfsa.htm). Or if you'd like a complete catalog, they'll post one to you; just phone their freecall number, 1800 677 609, or write to NFSA Shop, GPO Box 2002, Canberra City 2601. Orders can then be posted to the same address, faxed to (02) 6209 3801, or sent by e-mail to [sales@nfsa.gov.au](mailto:sales@nfsa.gov.au).

Of course you can always visit the Archive shop in person. A treasure trove of interesting audio-visual nostalgia, it's in McCoy Circuit, Acton ACT. There are also shops in the NFSA branch offices in Melbourne (223 Park Street, South Melbourne) and Sydney (84 Alexander Street, Crows Nest). ♦



# WiNRADiO's

## WR-1500e comms receiver

Fancy listening in on the MIR space station? How about receiving your own weather satellite images, or decoding transmissions from nearby jumbo jets? The WiNRADiO can do all this and more, and all you need is a fairly modest PC — plus of course a suitable antenna...

by Graham Cattley

**B**ACK IN JULY 1996, we looked at Rosetta Labs' WiNRADiO communications receiver, which mounted inside your PC as a standard ISA card. Despite the fact that the interior of a PC is perhaps one of the most (electrically) noisy environments you'll find, the WiNRADiO gave a pretty good account of itself, with a minimal (but still noticeable) amount of EMI filtering through into the signal. That was around three years ago, and the team at Rosetta Labs certainly haven't been resting on their laurels — producing both an improved internal ISA card model and a new external unit.

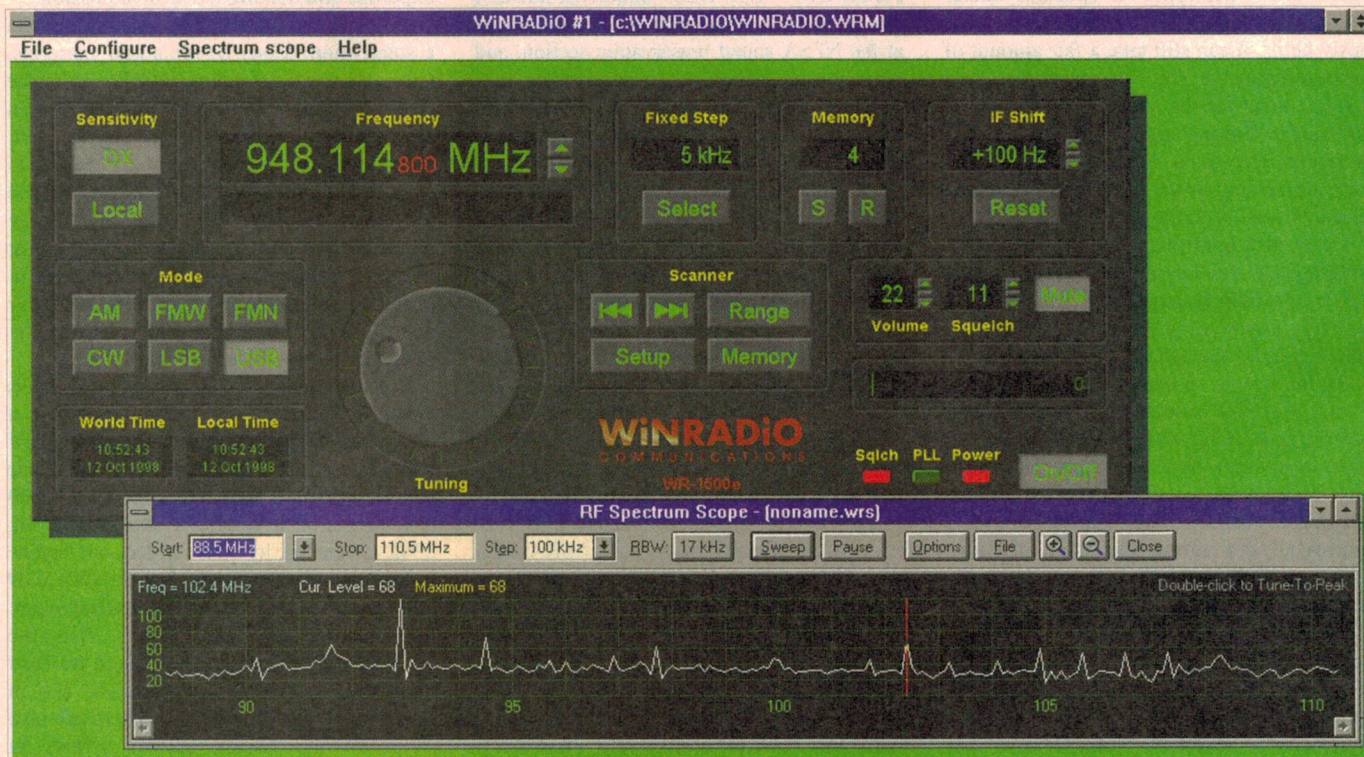
Rosetta were the first to combine a receiver

with a PC interface, and this wholly Australian effort has attracted a lot of interest both here and overseas, with a particularly large user base in Europe. For this review, we decided to take a look at the latest external model, which interfaces with the PC via a standard serial COM port.

The WiNRADiO WR-1500e is essentially the same as the new ISA card version, except that it's mounted inside a sturdy steel case measuring 122 x 45 x 216mm. The front panel sports only an on/off switch, with a forest of connectors mounted on the back panel. These include the 9-pin serial port, antenna and power sockets, and provision for an external speaker if desired. There is

also a high-density DB9 socket for interfacing to a PC Card adaptor, and a direct discriminator output for reception of packet and other digitally modulated signals.

Available as an optional extra, the PC Card adaptor is a type II PCMCIA Plug 'n Play card that allows you to use the WR-1500e with a modern laptop PC. It is supplied with its own interconnecting cable, and would be of interest to those with no free serial ports on their machine. Supplied as standard is a 1.5 metre serial cable, a 12V in-line plug pack, and a three metre long-wire antenna. Of course the supplied antenna isn't going to pick up aircraft or the odd orbiting satellite, but it's enough to get you up and running.



The virtual front panel of the WiNRADiO contains a large number of clearly marked controls, making the receiver's operation quite straightforward. The smaller Spectrum Scope window shows the peaks of energy through the selected band — you can clearly see the ABC at 92.9MHz, and most of the commercial stations near the top end.



*The WR-1500e with its serial cable on the right. On the left is the PCMCIA interface cable, while behind the receiver are the Database Manager and Digital Suite software packages.*

With the severe lack of controls on the box, some software to drive the receiver would come in handy, and this is supplied on a single floppy, with a 29 page User's Guide covering the software's operation.

## Trying it out

I DECIDED to try out the WR-1500e on my home system, running Win95 on a K6-300 with 32MB of RAM. After following the very brief hardware installation instructions (essentially telling you to plug it in and switch it on), I installed the WinRADiO software. Installation was straightforward, and I ended up with a WinRADiO start menu item. However this was as far as I got.

When it ran, the software attempted to detect the receiver on the COM port, but instead found nothing and so gave me the option of either running in demo mode (i.e., without the receiver) or exiting. I chose the latter, deciding to check all the cables and try again. Still no luck; so knowing that my system was using a non-standard IRQ for the serial port, I decided to start all over again — only this time using my Ye-Oldie 386SX 20MHz laptop.

This was running Windows 3.11, and had a guaranteed working bog-standard COM1 serial port. Despite this, the software still failed to detect the receiver, and again offered to run in demo mode. This was all very offputting to say the least, and so I gave it one last try on my work machine, a 486DX2 66MHz running Windows 3.11. Success!

This time the software detected the receiver first time round, and I was able to explore all the receiver's features — although unfortunately without access to an external aerial.

The manual supplied with the unit covered both the internal ISA and external versions of the receiver, and (understandably) concentrated mainly on the setup and configuration of the internal ISA card version. I would have liked to have seen more than a total of six lines of text on installing and troubleshooting the external version of the receiver.

## Specifications

THE WR-1500e (like most digitally tuned high quality receivers) uses a PLL-based triple conversion superhet configuration. In this case it tunes over the LF to UHF bands, from 150kHz up to 1.5GHz with a tuning resolution of 100Hz (or 1Hz for SSB and CW). You can select either upper or lower sideband, as well as AM, CW, and wide/narrow FM band reception, and it offers a 65dB dynamic range. Sensitivity for FM-N (12dB SINAD) and SSB is around 0.9uV from 150kHz, up to 0.35uV at 1.5GHz, with AM sensitivity ranging from 5uV to 1.9uV and

FM-W ranging from 1.8uV to 3.5uV over the same frequency range.

Five sets of IF frequencies are used over the full tuning range, and you have the ability to shift the IF frequency by +/-2kHz to help improve the quality of SSB reception by minimising adjacent-channel interference. Scanning is performed at a quite respectable 50 channels/second (FM) falling to 10 ch/sec in the AM band. An internal amplifier drives a small 50mm loudspeaker mounted in the top of the case, and this gives more than adequate volume, although you can connect your own speaker to the socket on the rear panel.

As you might have guessed from my troubles outlined above, the WinRADiO software is compatible with both Win95 and Windows 3.1, and only requires a minimum of a 386 with 4MB RAM. Note that the old DOS drivers for WinRADiO don't support the extra features in the WR-1500e, and so aren't included in the package. You can download them from the WinRADiO Website though, and with them you will be able to control all the WR-1500e's basic functions through a simple command line interface.

The WinRADiO 'front panel' layout is almost identical to the original version of the software, and that in itself reinforces the feeling that the interface is straightforward, intuitive and easy to drive (which it is). Large

clear buttons and a sensible layout mean that you really don't need the instruction book to drive 90% of the receiver's functions.

One of the more spectacular functions, called simply SpectrumScope, incorporates a quite significant change in how you use the receiver. It is essentially a spectrum analyser, which scans across the band, plotting signal strength in a separate pop-up window. The resulting peaks in signal power indicate the presence of radio transmissions, and by simply clicking on these peaks the receiver instantly tunes to that station. This means that you can quickly spot the transmissions in the band, and quickly hunt down the signal you're looking for, rather than having to scan linearly through the band. The start, stop and stepping frequencies are all easily set, and the resulting graph gives a clear indication of where the transmissions are.

Rosetta have dubbed this scanning/tuning system 'Visitune', and I can see this replacing the usual tuning knob and up/down buttons as the principal means of tuning PC-based receivers. Extra features, such as the ability to jump to an interesting point in the band, or being able to drag the mouse up and down the band and have the receiver tune continuously, make full use of the Windows GUI, while still allowing you to use the 'normal' virtual front panel as a more conventional interface.





## WinRadio's Receiver

### Extra Software

TWO EXTRA software packages are available for the WINRADIO: the WINRADIO database manager, and the WINRADIO Digital Suite. The former is a database that can store thousands of frequencies, call signs, class, power, reception modes and other data relevant to a particular transmission. This data can be searched or sorted by any criteria, and the receiver can be tuned by simply clicking on the relevant entry. You can also import frequency lists from existing databases or text files.

The Digital Design Suite is where the fun really starts, though. This provides a raft of applications, each designed to handle the various types of digital signal encoding. The various modules include Radio Fax (HF Fax), which can also receive and decode orbiting weather satellites to give you real-time weather maps; ACARS (Aircraft Communications Addressing and Reporting System), to let you decode transmissions between aircraft

and ground control; CTCSS (Continuous Tone Coded Squelch); Private Line subcarrier frequency signalling; DTMF decoding and logging; and finally Packet Radio (AX.25) decoding, covering both 300 and 1200b/s transmissions.

There are also some handy utilities supplied as well, including an audio recorder for saving data as WAV files, an audio frequency

### WINRADIO WR-1500e

A wideband communications receiver covering 150kHz to 1.5GHz, controlled from a PC via its COM port.

**Good points:** Australian design, and at a competitive price.

**Bad points:** Software had problems finding the receiver, on some machines.

**RRP:** Main receiver: \$799.95; Digital Design Suite: \$149.95; Database Manager: \$79.95.

**Available:** WINRADIO Communications, 222 St Kilda Rd., St Kilda Vic. 3182.

Phone: (03) 9525 5300, or email [info@winradio.net.au](mailto:info@winradio.net.au).

Website at <http://winradio.net.au>.

oscilloscope and spectrum analyser, and last but not least a signal classifier. This is quite a powerful piece of software that interprets the received signal, and tries to decide what sort of transmission it is (voice, data, silent channel or noise). This can help enormously when looking for a particular type of signal, and can speed up scanning considerably.

### Summarising

MY ONLY unhappy experience with the WR-1500e was the initial trouble I had in getting the software to detect the receiver; on some machines I had no success, while others gave somewhat intermittent results and failed to detect even after restarting Windows. It performed flawlessly on a bare-bones fresh installation of

Win95 on a borrowed machine, which suggests that my problems might have been caused by some nefarious non-standard drivers lurking in my system somewhere. Obviously some factors affect the program's auto-detection, but what, when or how, I have no idea...

Apart from that, I was most impressed with the WR-1500e's performance and its most competitive price. In fact, I would suggest that if you were going to purchase either the WR-1500e (or its cousin the WR-1500i, the internal version), you might well take the money you save and get the Digital Design Suite; the extra features would be well worth it — so long as you have a suitable antenna that is... For more information, check out the WINRADIO website at <http://winradio.net.au>, where you'll also be able to download a demo version of the WR-1500 software. ♦

## Two sets of five double-CD albums to be won!

# Australia's Radio Favourites

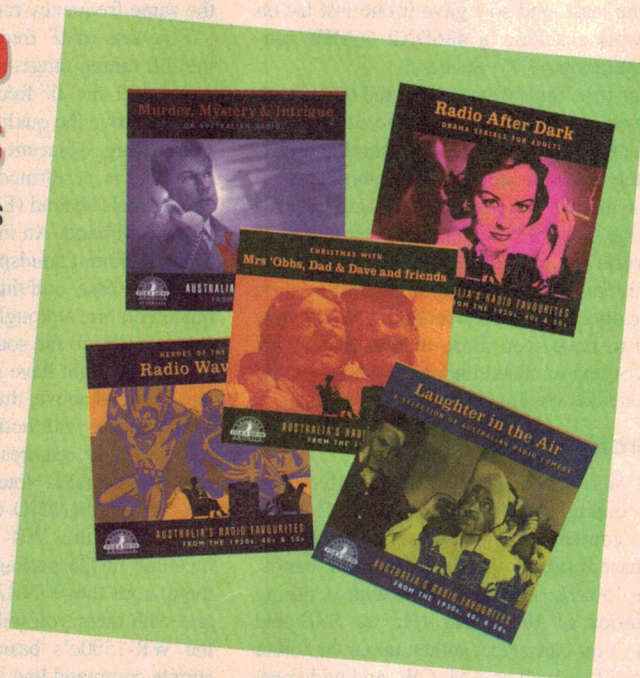
from the 1930s, 40s & 50s

Remember those classic Australian radio programs from the 'golden age' of radio? Serials like *Mrs 'Obbs, Superman, Dad and Dave from Snake Gully* and *The Search for the Golden Boomerang* — dramas like *When A Girl Marries*, *Hagen's Circus* and *White Coolies* — thrillers like *I Hate Crime* and *The Witch's Tales* — and comedies like *Fred and Maggie*, *Life with Dexter* and *The Bunkhouse Show*...

They're a priceless part of our radio heritage, and the sound restoration experts at the National Film & Sound Archive in Canberra have released many of the real classics on a total of five double-CD albums, which each sell for \$29.95. They're available from NFSA offices or by calling their freecall number: 1800 677 609.

Now, as a special offer to *Electronics Australia* readers, the NFSA has given us two complete sets of all five double-CD albums, to be won by the readers who come up with the two most interesting and/or amusing stories on this topic: **listening to the radio, then and now...**

**So if you'd like to win** one of these great sets of beautifully restored classic radio programs, get cracking! We'll need your stories, by mail to EA Radio Competition, C/- PO Box 199, Alexandria 1435 (or email to [electaus@magna.com.au](mailto:electaus@magna.com.au)) by December 16.





# MicroGram Computers

## Hi-Scan Bar Code Readers



High resolution CCD bar-code scanners which feature multi-interface communication with RS-232C, Wand & Keyboard

Emulation in one unit. Simply release the RJ-45 jack to change cables! Offering optical performance with a minimum resolution of 0.125 mm & maximum reading distance of 20 mm it is possible to read high-density, laminated & acrylic-covered bar codes.

Cat. No. 8458 **Hi Scan Bar Code Reader KB Wedge** \$699

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Cat. No. 8489 **CCD Bar Code Scanner Long Range KB** \$469

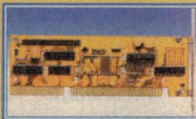
Cat. No. 8675 **CCD Bar Code Scanner Long Range Stand** \$79

As well as our standard range.

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## CD ROM IDE ISA Controller Card

Don't slow down your hard drive access speed! Put your CD ROM on a separate controller. This card will allow you to simply add a CD ROM drive. Address 1F0/170 and IRQ's 14,15 with primary or secondary select.



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## External CD-ROM Drive - Parallel Port



An external IDE Bus CD ROM 24x speed drive & case which connects to any parallel port. It includes built-in power supply, pass-through

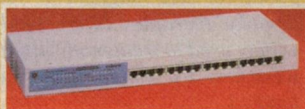
printer port & MS-DOS/Windows 3.1x, Win 95 & OS/2 Warp drivers. Achieve data transfer rates up to 960 KB/sec with an EPP (Enhanced Parallel Port). It can be connected to LPT1, 2 or 3 & has external audio connectors. Daisy chain up to 2 drives plus printer.

Cat. No. 6444 **CD ROM Parallel Port 24x Speed & Case** \$359

Cat. No. 6319 **Ext. Case for Parallel Port CD-ROM Drive** \$209

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Each individual port on these dual-speed hubs provide



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## Universal Numeric Key pads

Simply connect via keyboard or serial port. Features include:

- Compact size and easy installation
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Keyboard Connection

Cat. No. 8319 **22 Key (18 Key + 4 Fn Key)** \$132

Cat. No. 8169 **31 Key** \$132

Cat. No. 8353 **35 Key** \$175

Serial Connection

Cat. No. 8095 **32 Key Numeric Keypad** \$147

Cat. No. 8107 **22 Key Numeric Keypad** \$140

Also available are a 26 key calculator keypad with LCD display and an 18 key keypad keyboard wedge model.

Cat. No. 8486 **Calculator - keypad** \$155

Cat. No. 8487 **KB Wedge 18-key Keypad** \$139

## VGA to Video Converter



High quality at an affordable price, this external unit does not require software drivers & supports up to 1024 x 768 with true colour for both PAL & NTSC systems.

Connect to IBM, Macintosh or NEC computers. The output can be viewed on a monitor & TV simultaneously. Connections are composite video, S-VHS and Analog RGB (15kHz). The TV display can be frozen while the presenter prepares the next screen.

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## PCI Plug & Play Printer / Serial Cards

Available in either 1, or 2 port versions, these PCI bus PnP bi-directional parallel ports have an 83 byte FIFO buffer and are able to replace faulty motherboard printer ports as LPT 1/2. Support is provided for DOS, Win 95 & NT.

Also available, are single, dual, 4 & 8 port PCI PnP serial cards.



Cat. No. 2618 **1 Port Printer PCI PnP** \$159

Cat. No. 2619 **2 Port Printer PCI PnP** \$179

Cat. No. 2616 **1 Port RS232 16550 PnP PCI** \$185

Cat. No. 2617 **2 Port RS232 16550 PnP PCI** \$199

Cat. No. 2656 **4 Port RS232 16550 PnP PCI** \$425

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## Multi-PC Controller Two Way PS/2

A new low-cost manual two way switch box which allows one keyboard, monitor & mouse to control 2 PCs. Complete with two 3m cable sets to connect between the computers & switch box. Keyboard and mouse emulation is provided for booting under Win95/98 and WinNT.

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Consists of a 5.25" mounting rack & a removable tray for 3.5" hard drives. A keylock prevents inadvertent or unauthorised removal. Applications include:



- securing confidential data in a safe overnight
- providing off-site backups
- easy interchange of OS (eg DOS to Windows NT) by simply replacing drives

Cat. No. 6049 **IDE Kit** \$111

Cat. No. 6048 **SCSI Kit** \$121

Cat. No. 6200 / 6224 **IDE Tray / Frame Only** \$70

Cat. No. 6201 / 6225 **SCSI Tray / Frame Only** \$76

Cat. No. 6327 **SCSI Fast Wide** \$169

## Year 2000 BIOS Card

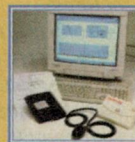


Even Pentium motherboards are not immune to the Year 2000 bug! The Year 2000 BIOS Card solves the problem of progression from 1999 to 2000 as well as 21st century leap years. It is an 8-bit card which provides year 2000 support for motherboards with a BIOS which only stores the year with two digits. i.e. 97 instead of 1997.

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## Blood Pressure Monitoring System

DynaPulse is a clinical accuracy blood pressure and pulse monitoring device that connects to your computer via a serial port. It displays the actual blood pressure waveform on screen as a visual confirmation of measurement accuracy. More importantly, systolic, diastolic, & mean arterial pressures are actually measured rather than calculated. The home version maintains data for up to six people.



Cat. No. 16000 **Blood Pressure Monitoring System** \$399

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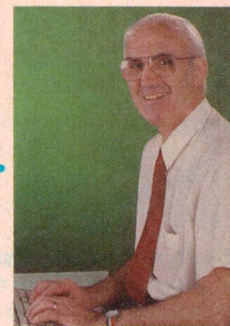
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## Back into the fray: more on those moot electrotherapy devices...

**Yes, while we've been looking into other discussion topics, the letters and e-mails have been quietly rolling in on that controversial subject of 'alternative electrotherapy' devices. So it's probably time to throw caution to the wind, take a deep breath and open the hornets' nest once again.**

**Y**OU MIGHT RECALL that the last time we ventured inside was in August's column, when I published some interesting letters from two medical practitioners — 'Dr Nose Best', from Western Australia, and Dr James Moxham of Glenalta in SA. I also presented a letter from Mr Chris Johnson-Walker of Grafton in NSW, suggesting that we try to give more insight into the operation of a fairly expensive 'clinical' PC-based device called the VegaTest, which is claimed to be able to diagnose all kinds of ailments.

Among the responses that have rolled in since then, we've actually had a couple that do provide a little further information on the VegaTest, as you'll see soon. But first, I'd like to present another letter from a GP, which came in very shortly after the other two. It's from Dr Kevin O'Dempsey, of Kallangur in Queensland, who also makes some very interesting points:

*I am a GP and I spend 90% of my time giving the advice "this will get better on its own" and/or "it's nothing serious". I often don't know EXACTLY what the problem is; my most important tool is time and doing nothing.*

*Contrast this with alternative therapies, where in my experience a diagnosis of illness or imbalance or a need to 'boost the (spooky) immune system' (and a course of treatments) nearly always occurs after a consultation. In fact most people attend these practitioners with the expectation of receiving treatment, or a course of treatments.*

*A lot of people will also insist on antibiotics for colds and coughs, when the extensive evidence doesn't support their benefit in most coughs and most sore throats.*

*It is well known that you can totally cure a quarter of all patients who walk through your door by giving them a tablet containing sugar or water. If you give an INJECTION of sugar or water that percentage may go up to 50%. If you really sell the tablet or injection to the patient, you can improve on these figures. Many of the others are helped but not cured.*

*Many of the patients will come back say-*

*ing they can't take those sugar pills or water injections, because of all manner of side effects. If you suggest a number of side effects then more will occur. This cure rate and side effect rate from a 'nothing' treatment is called the placebo effect.*

*The placebo effect tells us two things:*

*1. To accurately judge the effectiveness or side effects of a treatment, the IDEAL trial is a randomly assigned placebo controlled double blind trial. That is, a trial where the treatment and side effects are compared to a placebo treatment (e.g., water) and where the patients are randomly assigned to receive the treatment or the placebo, and where neither the patient nor the treater knows who is getting what until the trial is finished. To achieve statistical significance so that we can be assured that any results are unlikely to have occurred by chance alone, often these trials need thousands and sometimes hundreds of thousands of patients. Many people are cured by a treatment not because of the treatment, but because of the placebo effect of having any treatment.*

*2. The mind and beliefs have a powerful effect on illness and how much suffering results from illness. Giving sugar or water as a treatment (outside of a trial in which the patient is aware of the trial) would be considered unethical and shouldn't be used by doctors. However most doctors use things like hot lemon drinks in a similar way.*

*Incidentally only about 30 - 40% of medical treatments have been proven to work by such trials. This figure is increasing. Some trials may never be done — for example it would be hard to get approval for a trial comparing doing nothing and surgery for breast cancer. However there is currently a trial under way comparing doing nothing and surgery for prostate cancer.*

*It is unhelpful to argue against beliefs unless you enjoy a punch in the nose. An assault on beliefs is taken to be an assault on the person. Beliefs are widespread in conventional medicine. I have been in a group argument (some for, some against) with*

*other GP's, where a good trial has shown an old treatment doesn't actually work, and the argument was "I don't care what the trial shows — it must work because I have used it for past 10 years". I was protecting my nose at the end of the discussion.*

*Incidentally there are many trials that have been poorly designed and you can't draw any conclusions from them. Small trials often only suggest that a larger statistically significant trial may be useful. Many trial results are not confirmed in subsequent trials, but newspapers often report them as facts set in concrete.*

### Return to a 'natural age'?

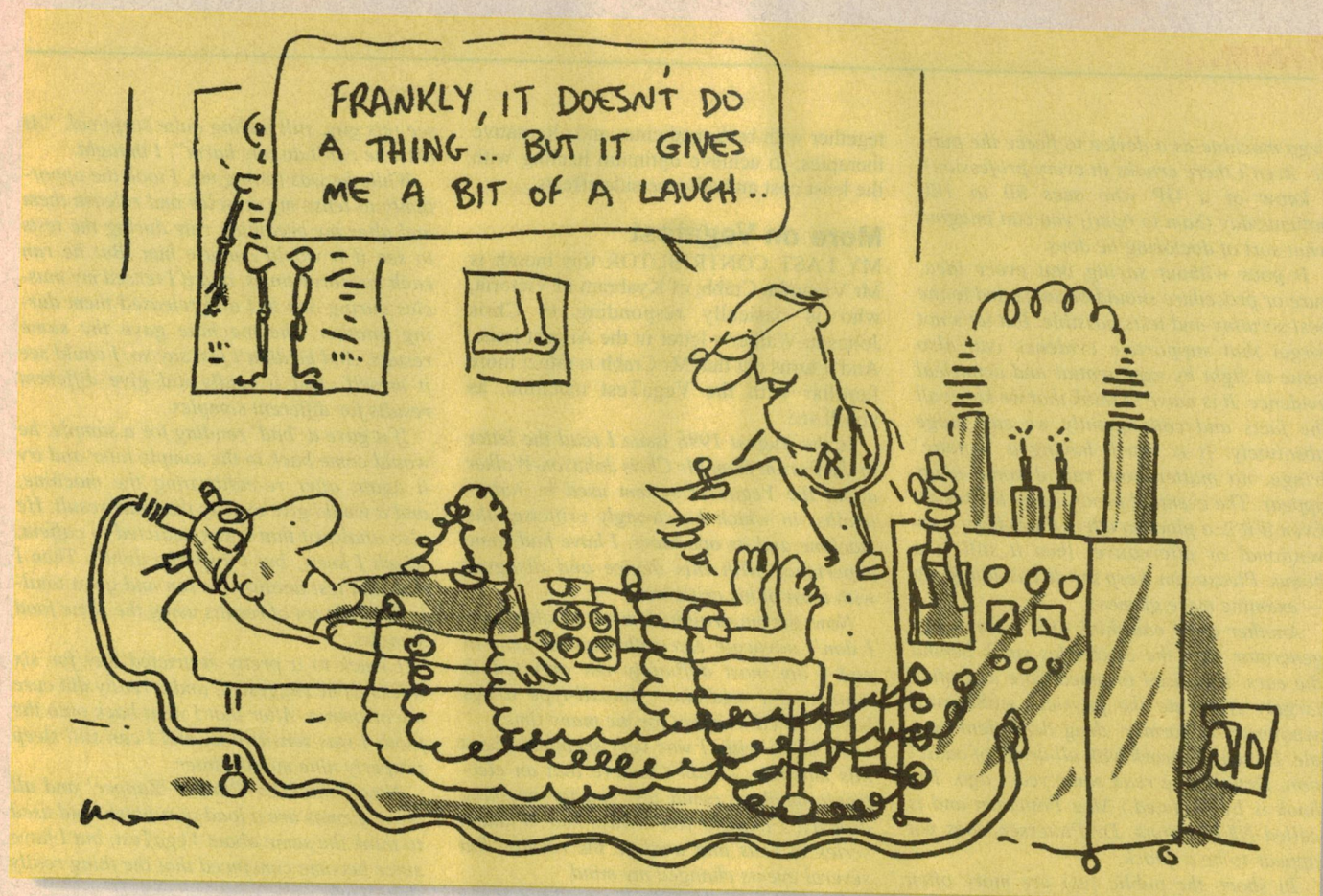
*In some ways I view the rise of alternative treatments in recent years as a parallel to the decline in religion and a questioning of the benefits and 'gee whiz' promises of the scientific age, in a search for an idealized more peaceful and 'natural' age. Unfortunately the real natural age was characterized by death in infancy and rarely living beyond 30, until there were scientific improvements in sanitation, water, diet and housing.*

*A lot of people take a bet each way and drink and smoke, but take mega doses of 'natural' vitamins (produced in a chemical plant), or use magnets or lasers or other 'spooky' therapies. Interestingly X-rays were widely used to treat many illnesses when they were first discovered. (The side effects came later...)*

*Many (all) people need beliefs to make sense of being alive. One belief may be "if I use these treatments I will be healthy and therefore I don't need to worry about illness and death". Which is similar to "If I follow my faith's teachings then I don't have to worry about illness and death".*

*Just for readers' interest, current trials are showing time and time again that it is usually not the vitamins (antioxidant or whatever) but the diet containing the vitamins that is of benefit. So surprise, surprise: if you eat lots of fruit and vegetables and grains and beans, and cut down on animal and dairy fats (also coconut and palm*





oil) and cut excess alcohol and stop smoking and exercise four times a week for half an hour, you will live longer and healthier and get less cancer, heart disease and many other illnesses.

So in medical treatments the onus of proof is on the treatment. Just because a treatment helped Aunt Mavis and her pet canary doesn't constitute proof. It is often useless to argue against a BELIEF in a treatment. A widely held belief doesn't constitute proof that a treatment works.

It costs an average of \$100 million and 10 years to bring a successful drug to market. There is a lot of drug company hype amongst the true data. Many alternative therapies are classified as foods and take eight weeks to be brought to the market.

For the claims of a therapy to be accepted they need to undergo proper trials — not just of effects, but of side effects as well.

There was a recent large trial to test the claimed benefits of antioxidants in preventing lung cancer. The trial showed that people taking the antioxidant vitamins developed MORE lung cancer (not less) than those not taking these supplements. So untested claims may be dangerous as well...

Many doctors do use diets and exercise, and meditation and vitamins, and mineral prescriptions and chiropractic, and acupuncture and hypnosis and massage and chinese medicines, where they have been

shown to work. Many also use these (and other therapies) where they have NOT been shown to work, as well.

I remember a person was selling a do it yourself 'laser therapy' device many years ago, for many hundreds if not thousands of dollars, and it turned out to contain an LED instead of a laser. Hmmm — I wonder if I could start up a new treatment based on the 'new miracle white LED therapy'? Move over Bill Gates, there is a new billionaire moving into town!

And thank you for those comments, Dr O'Dempsey. I for one found them very interesting, and I feel sure others will too. I especially liked your explanation of the placebo effect, and also your achievement of a balanced view of the strengths and weaknesses of traditional medicine, as well as those of the 'alternative' variety.

### Caveat emptor...

MOVING ON, let's look at a couple of responses which either refer to, or give more information about that VegaTest machine — and with a more positive slant. The first came as a letter came from Mr Joe Boehm, of Surrey Hills in Victoria. Mr Boehm only touches on the VegaTest, but also mentions some of the other devices we've looked earlier in the year. He's basically responding to the letter from 'Dr Nose Best', as you'll see:

It was refreshing to read Dr Nose Best's

letter, for it bristles with common sense. However, if we believe that a 'cure' has worked roughly proportional to the money it has cost, then this implies that most 'orthodox' medical treatments must, by this definition, be efficacious. If not, then it might be the fact that the cost of treatment is covered from general revenue. Then, shouldn't we have a hefty co-payment or even a full fee for service medical treatments? This idea contradicts other medical opinion, that a co-payment or full payment would be disastrous for the well-being of the population (probably more disastrous for the section of the population with a provider number).

Cardinal rule of medicine — first do no harm. Would one of your friends please comment on the frequency of iatrogenic illness in our health care (should be disease care) system?

This reminds me of Dr Mendelson (an American medico who also lectured at one of the US medical schools) who appeared on TV a few years ago, presumably as part of an Australian lecturing tour. He stated that 50% of orthodox medical practice is quackery, by their (Doctors') own definition.

The letter on Vega machines is worth following up as suggested by Chris Johnson-Walker. I have a number of absolutely positive direct and indirect experiences with this form of gizmo/practitioner. But I am also aware of crook practitioners who use the



Vega machine as a device to fleece the public. Aren't there crooks in every profession? I know of a GP who sees 80 to 100 patients/day (8am to 6pm); you can imagine what sort of doctoring he does.

It goes without saying that every idea, cure or procedure should be subjected to the best scrutiny and tests possible. But let's not forget that supportive evidence can also come to light by experiential and empirical evidence. It is naive to think that we know all the facts and consequently we can judge absolutely. It is worth having a 'lunatic' fringe, no matter how stupid some ideas appear. The eventual proof lies in the result. Even if it is a placebo effect (be it from conventional or alternative) then it still is a bonus. Please Jim, keep the discussion going — examine more gizmos!

Another one I can think of is a frequency generator with the electrodes stuck behind the ears. It is used to ameliorate and often largely eliminate the physical withdrawal symptoms of 'former' drug dependent people. It seems to work with all drugs of addiction. Details I've read some years ago. The book is by Dr (med.) Meg Pattersen and is called NET, I think. Dr Pattersen does not appear to be a quack.

In short, the public (us) are more often than we like between a fire hydrant and a dog. So, caveat emptor!

Hmmm — thanks for your comments too, Mr Boehm. It seems to me that some of the points you make are actually very similar to those made by Dr O'Dempsey and the other medicos who've written, although I suspect you might see yourself as coming from 'the other direction'. It's interesting that the closer one looks at many of these topics, the more they resolve into shades of grey rather than stark black and white, isn't it?

I think the aspect that I personally find most confusing about many of these alternative electrotherapy gadgets is that there are so many of them, often appearing to be surprisingly similar in terms of basic operation but frequently claimed to achieve quite different results. There's often a tendency for their protagonists to denigrate not only conventional medicine, but most of the competing alternative therapies as well!

I note your reference to the work of Dr Margaret Patterson and her NET system — which superficially seems to be related to the CET devices, and Dr Robert Beck's 'Brain Tuner', although I've received a letter and supporting literature which seems to claim that they're quite different. I'll try to present that one soon.

Finally, Mr Boehm, I appreciate your point about even the placebo effect having a worthwhile benefit. Perhaps conventional medical scientists should be investigating how best to harness the placebo effect

together with both medicines and alternative therapies, to achieve optimum healing with the least cost and adverse side effects...

## More on Vegatest

MY LAST CONTRIBUTOR this month is Mr Vasantha Crabb, of Kyabram in Victoria, who is basically responding to Chris Johnson-Walker's letter in the August issue. And it turns out that Mr Crabb is rather more familiar with the VegaTest machine, as you'll see:

*In the August 1998 issue I read the letter in the Forum from Mr Chris Johnson-Walker about the VegaTest system used by naturopaths, in which he strongly criticises the machine and its operators. I have had some experience with this device and disagree with most of his criticism.*

*Now, get me straight, I'm not an alternate; I don't advocate electrotherapy in general and I am most definitely not opposed to mainstream medicine. Amoxil-type drugs have worked wonders for me many times.*

*To begin with, I was very sceptical about this machine. I didn't believe that an electronic machine could test you for anything directly; I thought you always had to take a series of tests and analyse the results. But several events changed my mind.*

*But first, let's describe the machine. It is a small console with two test leads attached to it, one of which goes to the patient directly, and the other goes to the patient via two patch-bay like devices. The operator must regularly recalibrate the machine during tests and reads the output of an analog meter. Samples of the foods for which allergies are to be tested are placed in a bay on the machine one at a time, and the patient tested for each allergy individually. This machine sounds rather like the 'Listen' machine but it is in no way related to it.*

*First, a person who had just moved to the area went to a naturopath using such a machine. He had never seen the person before, and yet he correctly analysed a weak liver, allergy to peanuts, hyperactive kidneys and several allergies which the patient already knew about, but the naturopath had no way of knowing.*

*Then my mother went to him. He pulled off the same stunt again. He analysed a bad neck and several other problems she knew of, and some she didn't know of. And the diet really did work. When my mother was on it, her general health improved greatly.*

*Also, an electronics engineer I knew said the method the VegaTest machine uses to analyse the sample food was used in customs once to detect drugs which someone was smuggling inside their body.*

*At the time I was suffering chronic insomnia. I didn't get any sleep most nights. In desperation, I decided to take the plunge and*

*see this guy, still feeling quite sceptical. "At least he can't do any harm", I thought.*

*While he was testing me, I took the opportunity to tense my muscles and release them and alter my breathing rate during the tests to see if it would confuse him. But he ran each test three times, and if I tensed my muscles during one test and released them during another, the machine gave the same results. And he didn't just say so, I could see it myself. And it really did give different results for different samples.*

*If it gave a 'bad' reading for a sample, he would come back to the sample later and try it again after re-calibrating the machine, and it would give exactly the same result. He also analysed that I was addicted to caffeine, which I knew, but I knew he didn't. Then I saw him test another person and get a totally different set of results using the same food samples.*

*I stuck to a pretty restricted diet for six weeks as he suggested, and it really did cure my insomnia. After that I went back onto the foods I was sensitive to, and I can still sleep properly nine months later.*

*Now I think Dr Clark's 'Zapper' and all those gizmos are a load of rubbish, and used to think the same about VegaTest, but I have since become convinced that the thing really does work.*

*But what I really hate is sceptics who will bag anything that is a bit out of the mould just for that reason. Mr Johnson-Walker didn't even know how the VegaTest machine was used or even its real name, and yet he had the insolence to call it an 'obvious stupidity'. I believe in science and healthy scepticism, but extreme sceptics are just as bad as extreme alternates.*

*Thanks for those comments too, Mr Crabb. You certainly seem to be convinced about the VegaTest following your direct experience and that of your mother, although to be honest the evidence still seems rather anecdotal. Frankly I'd like to know more about exactly how the machine is supposed to work, and what it's claimed to diagnose. It still seems 'too good to be true' — although I take your point that if skepticism is carried too far, it may well act as 'blinkers' to prevent us from seeing anything we aren't already expecting to see.*

*That's all for this month, though. See you next time, I hope. ♦*

## EA's Web Site

The Electronics Australia web site is well worth a visit, if you're really interested in electronics. You'll find lots of useful electronics-related software, plus links to many other electronics sites. Just aim your browser at our URL:

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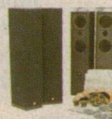
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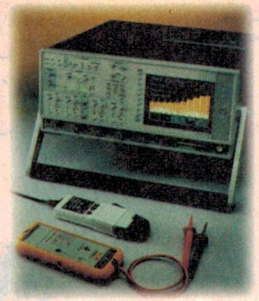


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# Serviceman



## Guess what was lurking at the end of a trail of red herrings? A familiar old foe...

**I**T SEEMS TO ME that we haven't had a good 'nitty-gritty' TV or VCR story for a few months. It's all very well to consider the resurrection of Junque, or the relatively inconsequential occupations of retirees, but I must not forget that the object of this column is to give extended consideration to the manifold manifestations of electronic mayhem. (Sorry! Got carried away a bit there...) So let's get back to real life, as it were.

This month we open the column with a story from Bob Parker, of Carlton in NSW. Bob's story is essentially about a dry joint, but a dry joint with a *difference*. In fact, I've struck only a few similar problems in the past, and it leaves one wondering why designers put such potential troublemakers in their designs. I'll expand on this further after Bob tells us his story about 'a simple fault, but many red herrings in a National TC-2077 TV'.

This saga began innocently enough, when one of my customers phoned to describe an unusual fault in her National TC-2077 TV.

It had suddenly lost raster and sound, with just a low hum emanating from the speaker. After checking that it wasn't only a problem on that TV channel, she turned the set off, but some hours later she reapplied power and was greeted by normal picture and sound.

Unfortunately this state of affairs was short lived, because after about 30 minutes the set failed again in the same way. Following another cooling off period, it failed after only 10 minutes or so and this time the fault was permanent.

When I arrived on the scene I removed the back and applied power, and was not especially surprised when the set functioned normally. The 'technician syndrome' had not failed to materialise! Knowing that this set had experienced problems with defective solder joints in the past, I tapped and prodded around the main board but was unable to provoke the fault.

Then as I was wondering what to do next, it failed in exactly the way the owner had described. Unfortunately I'd brought only a

few tools with me and had no schematic diagram for this model, so I concentrated on the apparent heat-sensitivity of the fault.

I began by selectively spraying components in and around the power supply with freezer spray, then applying heat with the hair dryer; but the fault stubbornly

**This month's main story takes us back to familiar territory: an intermittent fault in a National CTV. In the end, after a frustrating search, the cause turned out to be a familiar one — but one that really shouldn't happen nowadays.**

remained. I switched the set off, but then a hunch made me switch it back on again...

Up came a normal picture and sound for a short time, followed by the return to no raster and a low hum. A couple of cycles of this, and it was clear that once the fault occurred, it stayed there until power was removed and reapplied.

Much to my infuriation the fault was completely unpredictable and on one occasion the set performed normally for over an hour, resisting all my efforts to reintroduce the fault.

To cut a long story a bit shorter, I eventually found that spraying C553 (820pF 2kV) with freezer seemed usually to induce normal operation after going through the tedious power off/on cycle, so I ordered a replacement and duly installed it.

Once again I wasn't particularly surprised that the fault was as evident as ever, so now it was time to get serious. I ordered and obtained the schematic diagram, and because there was no space to work on the monster at the ranch, I returned to the customer's home a few days later armed with a CRO, isolation transformer and all necessary tools.

By this time the problem had again become unpredictably intermittent, and the first thing I established was that the main

+113V output from the power supply was essentially constant under both fault and operating conditions.

It didn't take long for my trusty CRO to find that the drive to horizontal driver Q501 was disappearing during the fault. This was due to the horizontal 'protector' (shut-down) function in 'jungle' IC501 triggering, though I wasn't sure why...

R512, a 10k 2W resistor which apparently provides the initial power feed to IC501 at switch-on, looked as though it had been running hot. One touch revealed that both its solder joints had completely failed, so I resoldered not only them, but the leads of about five other small power resistors whose joints were crystalline and highly suspect.

I also resoldered all other joints on the board which looked even slightly dubious — but as you've already guessed, none of this made any difference. So it was back to IC501.

Thankfully the fault was essentially permanent again, and I soon found that something in the circuitry was raising IC501's pin 5 voltage from the normal couple of hundred millivolts up to several volts and thereby triggering the 'protector' function.

More tracing and measuring led me to Q801, which seemed to be arranged to conduct under conditions of excessive CRT beam current (why do the National designers have to make their circuits so over-complicated? Their VCRs are just as bad!).

It was clear Q801 was conducting, and also that the +16.1V power supply output connected to its emitter was somewhat low at about +13V, with several hundred millivolts of about 100Hz ripple on it. Some quick checks with the CRO revealed that the switch-mode power supply was not oscillating continuously, but in bursts at about a 100Hz rate (not synchronized to the mains), and it was the resulting ripple on the +16.1V rail which was finding its way to the sound IC and speaker.

At this stage I couldn't work out what was cause and what was effect, so I bridged







## Serviceman

replace the back cover and work out how the symptoms related to the fault. It appeared that when Q551's emitter became disconnected and the current drain on the main +113V rail dropped enormously, the only way the power supply could regulate the +113V rail was for it to drop into the discontinuous 'burst' mode.

This abnormal mode caused the +16.1V power supply output to drop to about +13V with a substantial amount of ripple, which in turn resulted in Q801 conducting and triggering IC501's protection function, shutting off the drive to Q551 and 'locking' the set in this condition.

Although I didn't confirm it by measurements, I felt pretty sure that when I disabled the protection function, the extra current drawn by horizontal driver Q501 caused the power supply to raise the +16.1V rail closer to its normal value, resulting in the sound IC producing some hiss.

*Adding insult to injury was the fact that Q551's emitter lead was in a direct line behind C553, the capacitor which had initially seemed to be sensitive to freezer spray.*

In reality, some of the freezer overspray had been slightly cooling the defective joint! And the reason this joint was so unaffected by my tapping and prodding was that it was right at the edge of the PCB, with Q551 solidly bolted to its heatsink also mounted on the board's edge.

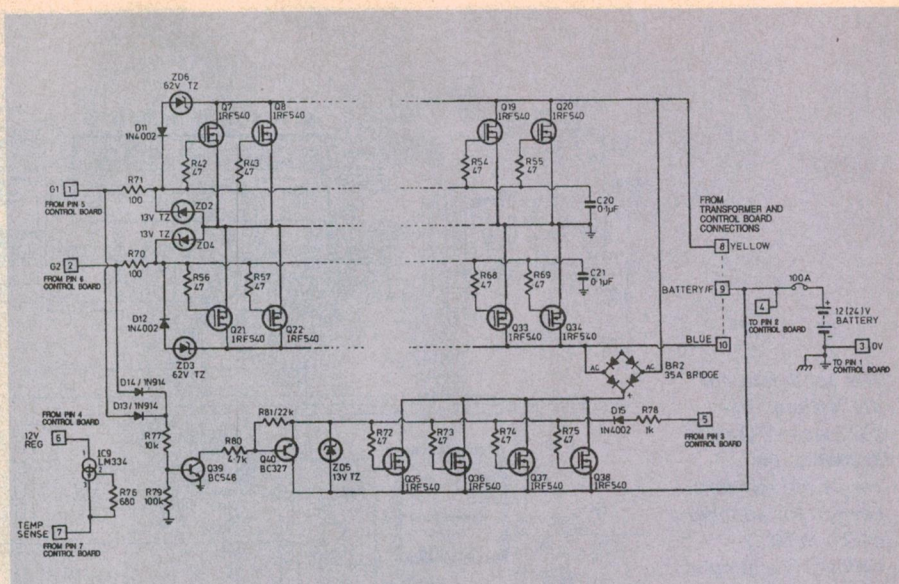
Had I known that the power supply dropping into a discontinuous mode was a symptom of an abnormally low load, I wouldn't have wasted nearly as much time finding the true fault.

*It would have also been much easier if the fault hadn't come and gone with no definite pattern. This is a fault I won't forget for a long time!*

So there you have it. A dry joint introduced by the very device added to the PCB to counter stress and the resultant dry joints!

I've struck this kind of fault in Hitachi and Philips CTVs, either at the line output transistor or the line output transformer. It seems that the designers acknowledge the risk of physical and/or thermal stress at these points, and so add the small rivets to provide something stronger than the PCB material to which to attach the heavier components. Unfortunately, it seems that the manufacturing process does not provide a facility to solder the rivets to the board — it's held only by the compression provided by the riveting process.

The transformer or transistor is soldered to the rivet, but the joint is good only so long as the rivet remains tight. After a time, heat cycling loosens the rivet and the dry joint is made. And they are the very devil to find, because the rivet looks to be perfectly tight! The broken circuit is *underneath* the rivet and is totally invisible.



*Here's part of the schematic for the Altronics 1.2kW inverter, with the power phase correction circuitry mentioned by Peter Laughton shown in the lower right-hand area.*

I believe that the rivets are still being used today. I can only hope that they are more secure, or that some better way has been found to keep them tight against the PCB...

I can also appreciate the confusion caused by the peculiar symptoms adopted by the power supply when its load was removed. In the early days of switch-mode power supplies, we were taught that 'hiccupping' was a symptom of *excessive* load. However variations in design later led to the opposite effect — hiccupping *off* load. I first struck this in an early Sony chassis, and it led me a merry dance too until the fault was found.

Thanks for that story, Bob. I'm sure that many readers will be dragging out some nearly forgotten intermittents to see if they have 'rivetted-in' dry joints. (Editor interjects: Including me!)

## Touch switches

NEXT WE HAVE a short note from Peter Laughton, a frequent contributor to this column from a place so far outback that he has to rely on alternative power rather than the grid that the rest of us take for granted. Some of Peter's earlier stories concerned inverters and this one is no exception, although he opens with unrelated comments on an item that appeared here a month or two back:

*Following on from the discussion in a recent EA regarding the touch-sensitive light switches, I have found that they are often so sensitive that they will trigger on power switching transients etc. It's most uncomfortable to be woken at 2.00am by a blinding light!*

My other comment with them is about the amount of RF crud they emit. At times it totally wipes out the radio spectrum, from the broadcast band to nearly 30MHz.

*Whilst on holidays recently, I had to turn these lamps off at the power point to be able to use the radio beside the bed. I wonder if those who worry about the RF from their*

*mobile phones have ever thought about the RF from these other sources? And how about electric blankets etc.?*

Another small story. My brother in law had just built his house and was in the process of testing the power points when the multimeter showed about 110 volts on the bathroom GPO whilst it was switched off. I was called in to investigate and found that indeed there was 110 volts AC there, whether the switch was on or off! Then I switched ranges on the meter (analog type), and the voltage dropped to 50 odd volts AC. On plugging in an appliance, the voltage disappeared — even if it wasn't switched on!

*I finally traced the problem to RF being induced into the house wiring from the local radio transmitter. A small mains rated capacitor across the power point fixed that.*

**Bang! Then darkness...**

PETER LAUGHTON continues:

*Now to my main story. It's one that happened only last week.*

About two years ago, I decided we needed a more powerful inverter to get our 240 volts from the 24 volt battery bank of our Remote Area Power System; so I invested in the Altronics 1.2kW inverter kit. This was duly assembled and has performed faultlessly from switch on — until last week. As I was sitting down to tea (when else?), there was a loud bang and the lights went off.

Switching on the circuit breaker only brought another bang, along with the smell of burning...

I switched the AC over to the standby inverter (an old square wave 2kW traction control unit) and we had power back on. After tea, I disconnected the Altronics inverter and took the covers off.

Apart from a burnt resistor on the power board, nothing was visible; so it was time for the 24 volt current limited power supply.



Disconnecting various power feeds showed the problem lay in the power devices. Further checks revealed that the four power FETs and the 35A bridge rectifier in the power phase correction circuit were all shorted.

These were disconnected and the inverter was again operational. I replaced the components with new types of power FETs, with twice the voltage and current rating of the IRF540s that were originally used. The bridge was replaced with a 1000 volt 35A unit, and the burnt resistor with a 1/4 watt type. We were back in business!

I re-read the assembly instructions etc., that came with the inverter, where it says that the network is there to protect the power devices from high back EMFs and tends to make the operation of the inverter quieter. The inverter was certainly noisy for a few days prior to the problem.

So why did they blow? The largest load on the system is a 450-litre fridge, plus several twin 40 watt fluoro lights. Maybe the fluoros are the problem? Anyway, at least the system is going again and I can see to type these notes.

I'm glad of that, Peter. I would hate to have to edit notes that you compiled while sitting in the dark! Seriously though, I agree with you about the touch sensitive switches in those lamps. I have heard innumerable complaints about them, their instability or their hashy RF emissions — 'crud' as you call it. I'm sure they are another of those

'designer' products that are created for no other reason than to show that it can be done. It's not as though people were crying out for a 'switchless' lamp...

A good design I once saw used two micro-switches under a large touch plate to perform almost the same function. It worked reliably and emitted no RF noise, and it was probably cheaper to make anyway.

And of course, your comment about the 110V of RF rekindles the old complaint about the high input impedance of modern digital (and some analog) multimeters. We have noted in this column a number of times just how misleading these readings can be. I have not yet struck a digi-meter with a selectable Lo-Z input but I would certainly look for one if I was in the market for a new meter.

Finally, your notes about the exploding inverter serves to remind the rest of us how lucky we are to have unlimited power available at the flick of a switch.

Thanks for your contribution, Peter. And I suspect that we will hear from you again, before too many months have passed.

But it seems that once again I have run out of space. I've become used to running three or four smaller stories each month, so one good 'gutsy' yarn leaves little room for smaller anecdotes. Oh, well! The stock of contributions will last longer as a result.

We'll see what next month brings. 'Bye for now. ♦

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## Notes & Errata

**Video Enhancer & Stabiliser (November 1997):** In some cases, the stabilising circuitry seems to be working correctly, but our suggested method of setup (using a visible black bar on the video screen) cannot be used because of insufficient range in the vertical delay preset pot RV1. Our suggestion in such cases is therefore to adopt the following approach: First set RV1 fully clockwise; if no black bar is visible at the top of the picture, leave it in this position. Now turn RV2 clockwise until the picture begins to tear at the top. Then slowly turn it anticlockwise until the picture stabilises again. Your stabiliser should now be adjusted to its correct setting, or very close to it.

**Experimenting with Electronics (April 1998):** The voltage converter circuits shown in Fig.4 and Fig.5 (pages 28 and 29) show the BC327/337 output transistors in a rather self-destructive configuration. Their positions should be swapped so the BC337 collectors connect to the positive rail (+9V) and BC327 collectors are tied to ground, with their emitters joined at the output — a standard emitter-follower, push-pull configuration. ♦



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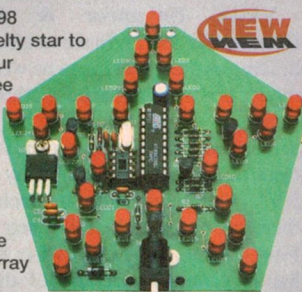
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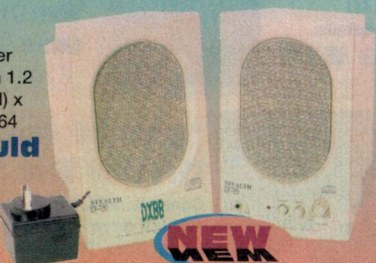
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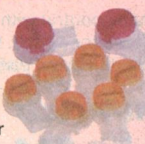
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page 3.

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drive In - Hex (allen), Torque

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# Circuit & Design Ideas

Interesting original circuit ideas and design tips from readers. While this material has been checked as far as possible for feasibility, the circuits have not been built and tested by us. We therefore cannot accept responsibility, enter into correspondence or provide any further information.

## VHF preamplifier

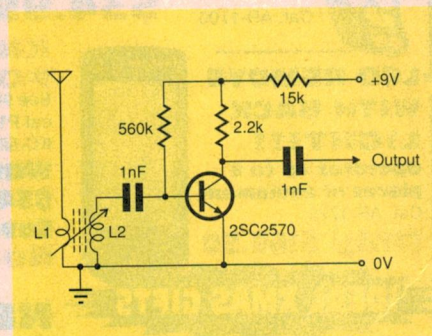
THIS IS A very simple and inexpensive circuit, but it makes an effective preamplifier for the 88-108MHz FM broadcast band. As you can see, it is an ordinary common emitter amplifier, built around an NPN VHF transistor. I used a BP200P in my prototype, but any small-signal NPN transistor with an  $f_t$  of around 500MHz can be used. The only critical part of the circuit is the coil; L2 is wound first, with three turns of 22SWG on a stan-

dard 8mm slug-tuned RF coil former. L1 is wound on top, with 1.5 turns of 24SWG wire.

The antenna is connected to the top end of L1, and the output of the preamp goes directly to the aerial of the receiver. The circuit can also be used for improving reception in the two-metre amateur band, but the coil windings will need to be changed.

Pradeep G.

Alappuzha, South India \$30



## Trailer light supply

SOME EUROPEAN (and British) cars built to German wiring specifications have two completely independent left and right circuits for the marker lights. Each circuit has its own fuse, with the idea being that if a short-circuit occurs in either side (causing that circuit's fuse to blow), the other circuit will remain operative — enabling other drivers to still see where the car is.

A further bonus of this system is the provision of a switch to power either circuit independently when the vehicle is parked at the side of the road at night. Only the marker lights on the appropriate side are turned on, conserving the battery.

The problem is that the seven-pin trailer wiring standard used in Australia and New Zealand allocates only one circuit to the trailer's tail lights. Therefore, when wiring up a trailer

socket you can either connect to the left or right circuit in the car (causing an imbalance in brightness in the car's tail lights and the risk of the driver switching on the wrong parking lights), or join the car's left and right circuits together and power the trailer from the junction. This negates the safety advantage and removes the useful independent-marker-light feature.

I got around these conflicts by using two diodes to effectively form a high-current OR gate, and including a fuse between the cathode junctions of the diodes and the trailer, with a current rating lower than either of the fuses in the car. A short-circuit in the trailer will blow this and leave the car's marker lights operative.

A slight disadvantage was a forward voltage drop of nearly 1V using silicon diodes. This caused a dimming of the trailer's lights and heating of the diodes. To the rescue came a range of

## THIS MONTH'S WINNER!

Schottky power diode pairs, packaged in a TO-220 case with an internal common-cathode connection; these provide a very elegant packaging solution and simplify the connections. They have a forward voltage drop of about 0.5V per diode and a good current-carrying capability.

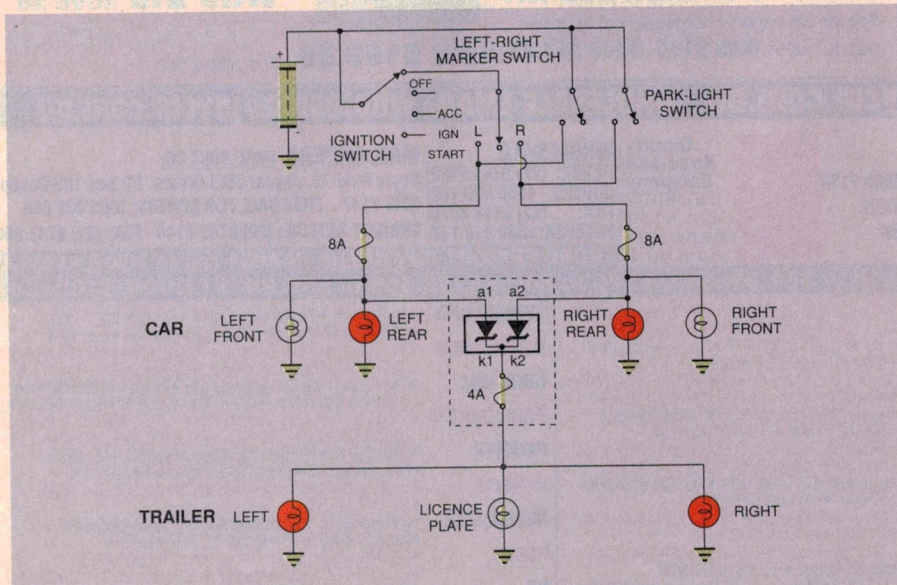
The assembly should be housed in a part of the vehicle protected from the weather; the boot compartment near the rear light clusters is ideal. Make sure it is protected from objects moving about in the boot. Insulate any exposed connections to the fuse-holder and the semiconductor's leads with heat-shrink tubing.

The table shows the various types of dual-Schottky devices available, and prices vary considerably between different makes; one manufacturer's 7.5A and 10A types were right down in the \$3-\$4 range.

Although not a 'leading-edge' application, this is an example of a modern component in a very simple circuit providing a no-compromise, reliable and neat solution.

John Phillips

Upper Hutt, New Zealand \$40



## High power Schottky diodes

Part No.	Max Current	Package
MBR1535CT	7.5A	TO-220
MBR1545CT,		
PBYR1545CT,		
STPS1545CT	7.5A	TO-220
PBYR2035CT	10A	TO-220
PBYR2040CT	10A	TO-220
BYV133-45,		
PBYR2045CT,		
STPS2045CT	10 A	TO-220
STP3045CPI	15A	TOP3I
		(isolated package)



As an added incentive for readers to contribute interesting ideas to this column, the idea we judge most interesting each month now wins its contributor an exciting prize, in addition to the usual fee. The prize is an open order to the value of \$300 from Oatley Electronics! Yes, that's \$300 to spend on anything you want from Oatley's wide range of products, so check out their ad (or their Website) to see what's on offer.

Win our  
**'IDEA OF THE  
MONTH'  
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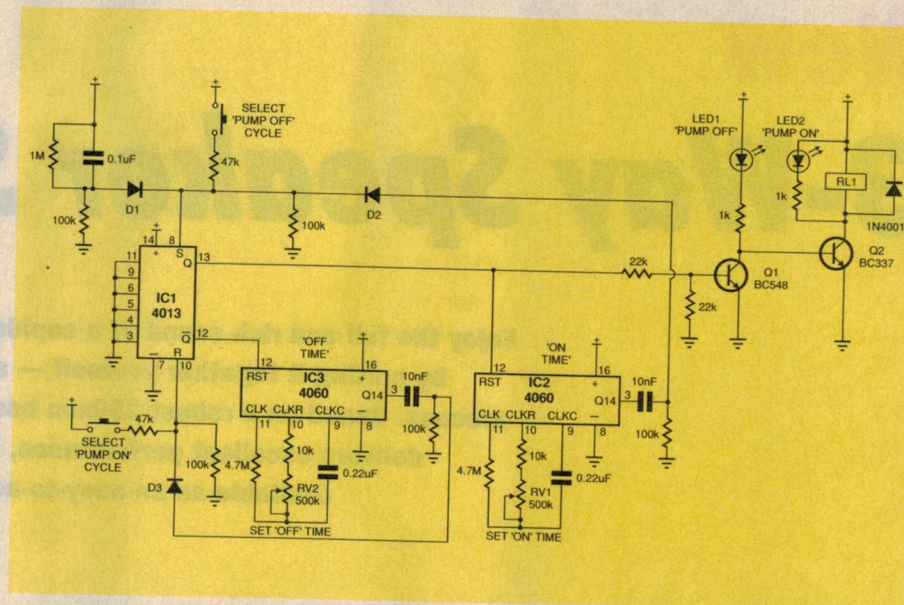
## Bore pump timer

IN THE OUTBACK, we use bore pumps to fill cattle and sheep troughs with water. In the past, float switches have been used to control the electric bore pump, but these switches are often damaged by the beasts — causing the pump to either run continuously or not at all. This electronic timer drives the bore pump on a timed basis, and once set up can continue to supply the water to the trough without problem. The design is actually in use, in the outback. The idea is to have the pump running in an on/off cycle in which the on and off cycle times are adjustable.

IC1 is setup as an RS flip-flop which controls whether the ON or OFF timer is running. IC2 and IC3 are 14-stage binary ripple counters with internal oscillators.

Assume IC1 is reset with pin 13 low and pin 12 high. This causes IC2 (ON timer) to start counting, with Q1 turned off, and Q2 on operating the relay and starting the pump. Once the preset time has been reached (between 1 and 40 minutes, set by RV1) pin 3 of IC2 goes high, pulsing the SET input of the flip-flop. The flip-flop then turns on Q1 and so Q2 turns off, releasing the relay and stopping the pump.

Now IC1 pin 12 is low, causing IC3 (the



OFF timer) to start counting for the other half of the cycle. RV2 sets the off time between 1 and 40 minutes, and when this time has elapsed the whole thing starts again as the pulse to pin 10 of IC1 resets the flip-flop.

Once the times are adjusted (which requires monitoring in the beginning) the system is left alone and needs only seasonal adjustment.

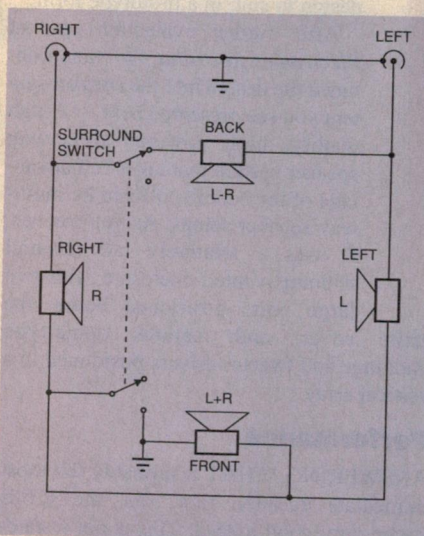
The two push buttons are used to start the

procedure on a particular cycle or to test a cycle, and the LEDs show the status, which should match the running of the pump. Power is supplied from a 12 volt source (solar/generator battery system). The circuit uses CMOS technology, which draws little more than the relay requirements.

Eric Rodda

Parkholme, SA \$40 ♦

## Simplest surround sound system



ONE DAY, I was listening to my stereo with a pair of headphones and an extension cable, when the music suddenly switched from stereo to a strange mono sound... I checked out the extension cable, and found that the ground wire had become open circuit.

After fixing the cable I experimented by connecting speakers to different wires, and got different results. I then did some maths, and found that the signals coming from each speaker were the same as those from a surround sound decoder (e.g. L, R, L-R, L+R).

So here it is — the simplest surround sound decoder you can have, and while you won't get an even response from each speaker, it is about as cheap as you can get... The switch simply disables the surround (front and back) speakers, giving you normal stereo.

Mark McGough

Stoneville, WA \$30

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READER INFO NO.18



# Outstanding New 3-Way Speaker System

Enjoy the full and rich sound of a sophisticated three-way speaker system by putting it together yourself — and save hundreds of dollars in the process. Based on a robust 250mm bass driver, the JC50 speaker system delivers excellent performance, has a power rating of 120W, and is available as an easy-to-assemble kit with pre-built cabinets.

by Rob Evans

**T**HREE-WAY SPEAKER systems have always been somewhat of an enigma for loudspeaker designers, and have probably sent a large number of them prematurely grey. The problem, in a nutshell, is that multi-way speaker systems promise much, but it's extremely difficult to turn that full potential into a reality.

The promise of a three-way (or more) speaker system over the more common two-way setup is that each driver will then handle less of the overall audio spectrum, and can therefore operate within its natural or 'optimum' frequency range — in other words, woofers aren't asked to deliver signals in the upper frequency range, and tweeters don't have to cope with mid-range energy. This is turn means that the drivers deliver lower levels of distortion, have a more linear output (thanks to the reduced frequency range) and in many cases, can cope with higher power levels. In fact this is almost a mandatory arrangement for higher powered systems using large bass drivers.

The difficulty, though, is seamlessly merging the acoustic output of all these drivers into one cohesive result, in the amplitude and phase domain. You might imagine that this job should only be twice as difficult when going

from a two- to three-way system, since there's now two speaker-to-speaker transitions to deal with rather than one. But in practice it's much more demanding than that, since the midrange driver's characteristics must match those of both the woofer and tweeter, and the 'tuning' process tends to be somewhat interactive — changes in one crossover region will invariably effect the other...

## System specifications

<b>Frequency response:</b>	35Hz to 20kHz +/-3dB
<b>Sensitivity:</b>	89dB (1W @ 1m)
<b>Impedance:</b>	nominally 8 ohms, 5 ohms minimum
<b>Power:</b>	120W
<b>Crossover points:</b>	600Hz and 5kHz
<b>Bass driver:</b>	250mm Re/sponse
<b>Midrange driver:</b>	50mm Re/sponse dome
<b>Tweeter:</b>	19mm Vifa dome

There's been a number of fine examples of just how this setup can go wildly astray. Many readers will recall the rash of multi-way speakers that appeared through the 1970s and 1980s, which took the idea of 'more is better' to an extreme. Three, four, five and even six-way speakers were all the rage from (particularly) the Asian

manufacturers, and frankly, the performance of these seemed to get worse with every added driver.

It's not black magic that resolves the dilemma of the multi-way speaker carrot though. In the JC50 three-way system featured here, the impressive result is mainly due to the thorough approach of speaker designer Phil Routley from *Occasion Audio*, who completed the painstaking work of matching three drivers and then developing a box and crossover design to suit, in a prototype form.

After further evaluation here at *Electronics Australia*, Phil then fine-tuned the design into the speaker system you see presented here — a high quality, high powered three-way speaker system that takes full advantage of the benefits offered by multi-way speaker setups. As you can see, it uses a relatively tall (around 850mm) vented enclosure with two large ports positioned below the grille cover, and features dome-type midrange and tweeter drivers positioned in a vertical array.

## Performance

ANSWERING WHAT'S probably the most immediate question first: yes, the JC50s sound very good indeed. This is not a state-





ment given lightly either, as we critically listened to the speaker with a variety of source materials and at various power levels, and performed a wide range objective tests using our in-house IMP loudspeaker testing system. You can see some of those results reproduced here.

While it's not an immediately obvious point, one check that really does show that the acoustic output from the various drivers is well integrated is that the sound is consistent and balanced over a wide range of listening angles. If this was not the case

(as in many other multi-way systems), the midrange content will tonally change as you move through the vertical and horizontal planes, indicating phase additions and cancellations.

You can easily try this test yourself by crouching in front of a set of speakers, then smoothly moving up, down, left then right, to check the sound at all angles. You'll need source material that is fairly demanding or full in the midrange area (say, vocals), and be prepared to look rather silly as you squat and bob around in front of the

speakers; but the exercise can be quite illuminating. (If you're worried about looking like a demented chicken, do this test while no one else is at home...)

In the case of the new JC50, the 'phase coherency' of the system was also confirmed by a series of response plots taken at various angles around the speaker.

This point about phase coherency really is an important issue in multi-way speakers in particular, as it directly effects the system's clarity and linearity in the critical midrange area. Speaker designers can pull all sorts of

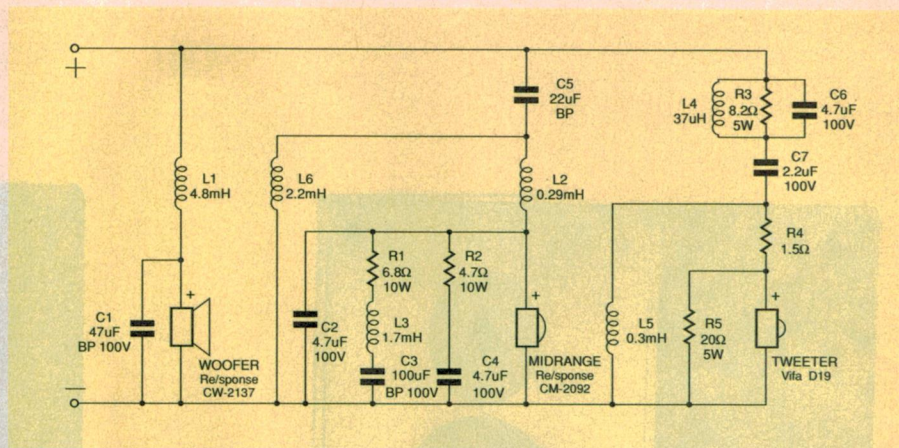


## 3-Way Speaker System

stunts to arrange for a nice flat on-axis response plot, but the story can change quite dramatically when *off-axis* tests reveal large peaks and dips in the midrange region — of course, those speakers would also fail the demented chicken test...

Along with the all-important midrange region though, the JC50s also delivered impressive performance at both the low and high ends of the audio spectrum. The treble range is very extended and detailed, while the low end delivers a nice degree of low-down 'punch' without sounding lean or soggy. As you can see from the published response plots, the JC50 has a very linear output over the audio band, with on-axis -3dB points of around 35Hz and 20kHz.

The other point of note is that the JC50s handle high power levels without fuss, and produce very low distortion levels in the process. This all adds up to a speaker system that's very enjoyable to listen to over its full power range, with no sign of listener fatigue; you'd normally pay thousands of dollars for that privilege...



**One of the key factors in the JC50's impressive performance is its highly-developed crossover, which divides the audio band at 600Hz and 5kHz and features both impedance correction and resonance compensation networks.**

### The components

THE JC50 DESIGN is based on a robust 250mm (10") Re/sponse bass driver which sports a polypropylene cone with a rubber surround, plus a quite massive magnet assembly. It also offers an impressive power rating of 160W, and after an extended 'run-in' period exhibited a free-air resonance (Fs) of 28Hz, a

total Q factor (Qts) of 0.34, plus an equivalent compliance volume (Vas) of around 88 litres.

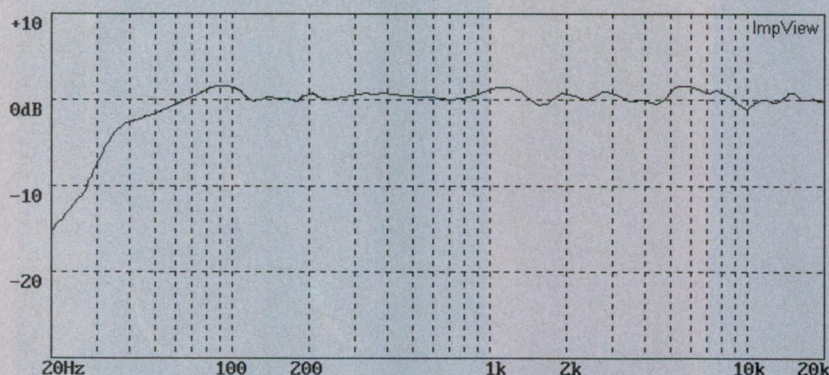
These Thiele/Small parameters were used to derive an enclosure design which would support the driver's output down to at least 35Hz, but would also be of a reasonable size. The result is a 53-litre box, in a relatively narrow tower format that's tuned to 37Hz by two 68mm ports. The ports have a flared exit point to avoid audible air turbulence or 'chuffing' at high power levels — which is an important feature here, since the system moves a surprising amount of air through the vents when driven hard.

The critical midrange part of the spectrum is handled by a quite exotic 50mm domed unit, which is fitted with its own sealed enclosure and a 'doped' fabric dome. Along with the care taken in the overall design of the JC50s, this Re/sponse midrange unit plays a crucial role in achieving the system's clean and balanced overall sound. The driver has a very smooth response in its own right, and would be quite at home in a range of other high-quality speaker systems.

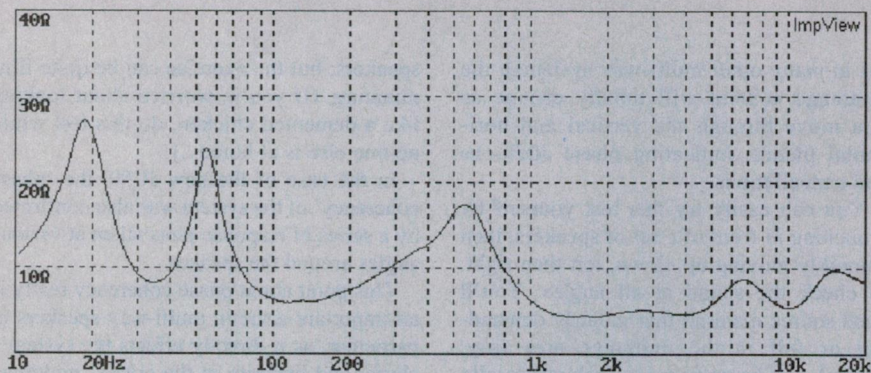
Lastly, the tweeter unit used in the JC50 is the familiar D19 dome tweeter from Vifa, which offers a ferrofluid-damped voice coil driving a 19mm polymer dome and has usable output up to around 20kHz. The D19 performs very well, with the only significant quirk being a minor (but broad) peak in its response at around 15kHz, which can cause an audible edginess on some types of music. As you'll see though, this is nipped in the bud by the JC50's crossover.

### Refined crossover

THE CROSSOVER network used to combine the output of the three drivers is based on conventional second-order LC filter stages, but has been enhanced and fine-tuned to achieve the best result from the JC50's drivers. The low-to-mid crossover point is set to 600Hz, while the mid-to-high changeover occurs at around 5kHz, where additional net-



**While it only tells part of the story of course, the JC50's on-axis response plot (above) is very smooth and extended. The impedance plot (below) shows the expected dip at the enclosure tuning point of 37Hz, and a minimum impedance of about 5 ohms.**





works have been included to smooth the transition and control driver resonances.

Working through the schematic shown in Fig.1, inductor L1 and bipolar electro C1 form a low-pass network for the woofer with a nominal roll-off rate of 12dB/octave. Here, the coil is a high-powered type using heavy-gauge low resistance wire, which results in a woofer drive circuit that's both efficient and can handle very high power levels.

The system's dome midrange is fed via high-pass network C5/L6, then low-pass section L2/C2, which combine to set the driver's nominal passband at 600Hz to 5kHz. In this section R2 and C4 have been included to compensate for the driver's natural rising impedance — which would otherwise influence the response of the L2/C2 low-pass stage — while R1, L3 and C3 form a low-Q tuned shunt set to around 330Hz.

This latter network has been included to damp the midrange driver's natural (free-air) resonance, which in this system is only about one octave below its low rolloff point of 600Hz. By damping the driver's resonance in this way, the midrange then exhibits a smooth LF rolloff and can withstand high power levels near the bottom of its frequency range.

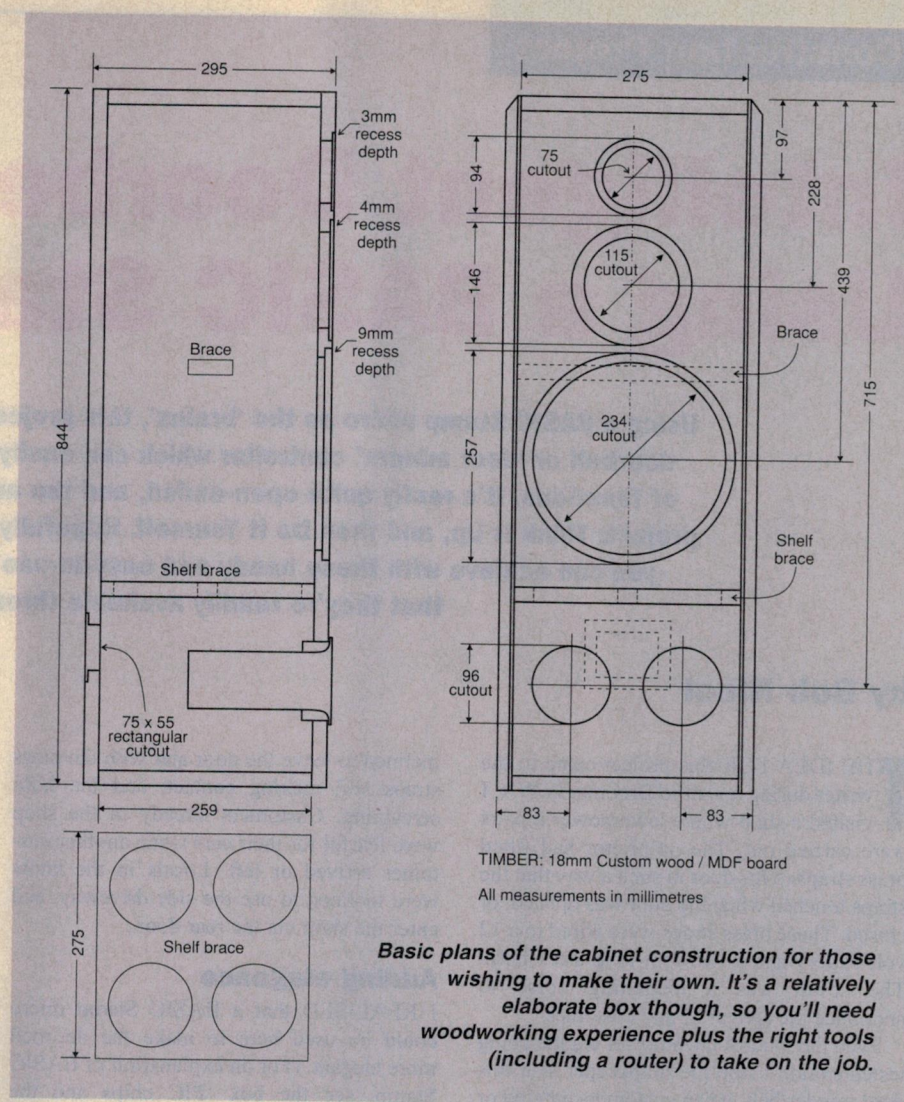
The tweeter's 5kHz high-pass network has a similar degree of fine tuning, with its main second-order filter (C7 and L5) fed via a tuned 'stop' circuit formed by L4, R3 and C6. This low-Q circuit results in a modest degree of tweeter attenuation at around 15kHz, which tames the D19's natural peak in this area. And lastly, the 'L-pad' attenuator network formed by R4 and R5 reduces the overall tweeter output by a small degree, to match the output level of the other drivers and balance the overall response.

## The kit

IF THE JC50s have fired your interest, pop into your nearest Jaycar store where (by the time you read this) you should be able to buy a full kit of parts for \$869 — including pre-built enclosures. They should also have a complete JC50 driver kit (everything *except* the enclosures) available for \$579, to suit more intrepid constructors who have sufficient woodworking skills and equipment to build their own boxes. Note that we're publishing a simplified version of the cabinet plans near the end of this article.

When it comes to putting the system together from the full (with cabinets) kit, though, you'll only need a couple of free hours, a little patience, and a few basic tools — including a soldering iron.

The first step is to install the two plastic vent tubes in each enclosure, which are a self-sealing push fit. These will be fairly tight, so the last centimetre or so will need to be knocked in — while using a piece of timber to protect the vent lip and enclosure's finish. The cabinets are now ready for the



job of installing the connector plate, crossover and drivers.

Start by soldering suitable lengths of the supplied wire to the input connector plate, which can then be screwed into its matching cutout on the rear panel of the box. Regardless of the fact that this is a ported design, each component that's installed must be fully sealed to the panel if you want the best possible performance from the system.

The plate should therefore be well sealed into its matching cutout using some type of compressible gap sealer such as a dedicated speaker sealant, or rubber stick-on draught strip. With the connector plate in place, the cabinet damping material can then be fitted to the inside surfaces of the box using a staple gun — or failing that, some form of contact adhesive.

The crossover is supplied as a pre-built module, with the various connection points and their polarities marked on the copper side of its printed circuit board. Solder suitable lengths of wire to the crossover's speaker output connections while **taking careful note of the polarity of each lead**, then connect the incoming wires from the terminal

plate to the crossover input connections. **Carefully note the polarity here, too.**

Next, the crossover can be screwed to the cabinet's inside rear panel (almost directly behind the woofer opening), and the flying speaker leads trimmed to appropriate lengths. Apply your sealing compound or tape around the perimeter of each speaker frame, then solder the leads to the speaker terminals — note that all drivers are connected *in-phase*, as shown in the crossover's schematic diagram.

That's it; screw the drivers in place, attach the grille frames to the front panel, and you're done. You now have a set of high quality three-way speakers that should give you years of enjoyable listening. ♦

## The JC50 kit

Available from:	Jaycar stores
Full kit price:	\$869
Speaker kit (less enclosures):	\$579
Pre-built enclosures:	\$319



# Intelligent Doorbell Using a BASIC Stamp

Using a BASIC Stamp micro as the 'brains', this project allows you to build an intelligent doorbell or 'door minder' controller which can easily be programmed for a wide variety of functions. It's really quite open-ended, and the author has designed it as a 'TIU/DIY' project: Think it Up, and then Do It Yourself. Hopefully it will inspire you to see just what *you* can achieve with these handy and easy-to-use little controllers — especially now that they're readily available through Dick Smith Electronics outlets.

by Bob Nicol

**T**HE IDEA FOR this project came to the writer during a visit to Broome, in WA. I visited a shop where lawnmower repairs were carried out. The proprietor had fitted brass straps to his door in such a way that the straps touched when the door was opened, or closed. These brass straps were wired to a 12 volt battery and a two-foot-long truck horn. The result was a deafening noise to announce the arrival of any customer.

Even the loudest lawnmower engine being tested couldn't stop the shopkeeper hear this door minder/bell, when customers entered or left the shop!

This simple design worked well, but it sounded its raucous message on many more occasions than were needed. No one was

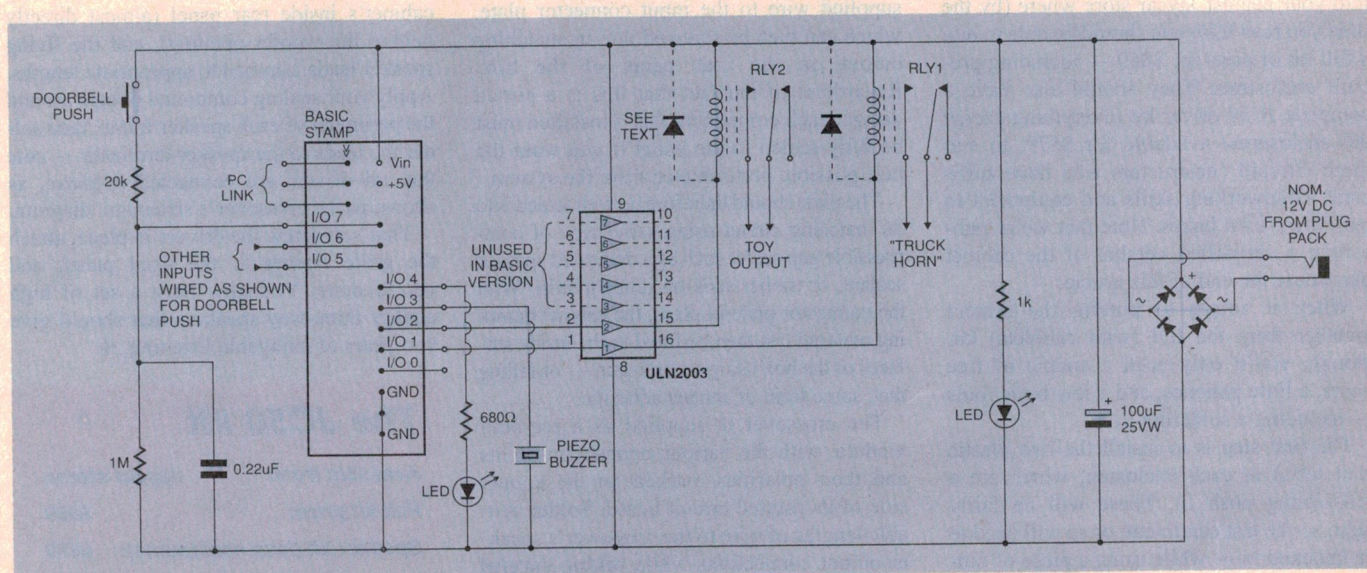
inclined to leave the door ajar with the brass straps still making contact, and the horn screaming. Customers already in the shop were fearful for their ears when another customer arrived or left. Locals in the know were inclined to use the side driveway, and enter the shop via the rear door...

## Adding elegance

I REALISED that a BASIC Stamp micro could be used here to make the doorbell more elegant. (For an explanation of BASIC Stamp, see the box 'PIC chips and the BASIC Stamp'.) How about sounding the truck horn when a customer arrived, and put a timing loop in to sound something less raucous over the next 10 or 15 minutes?

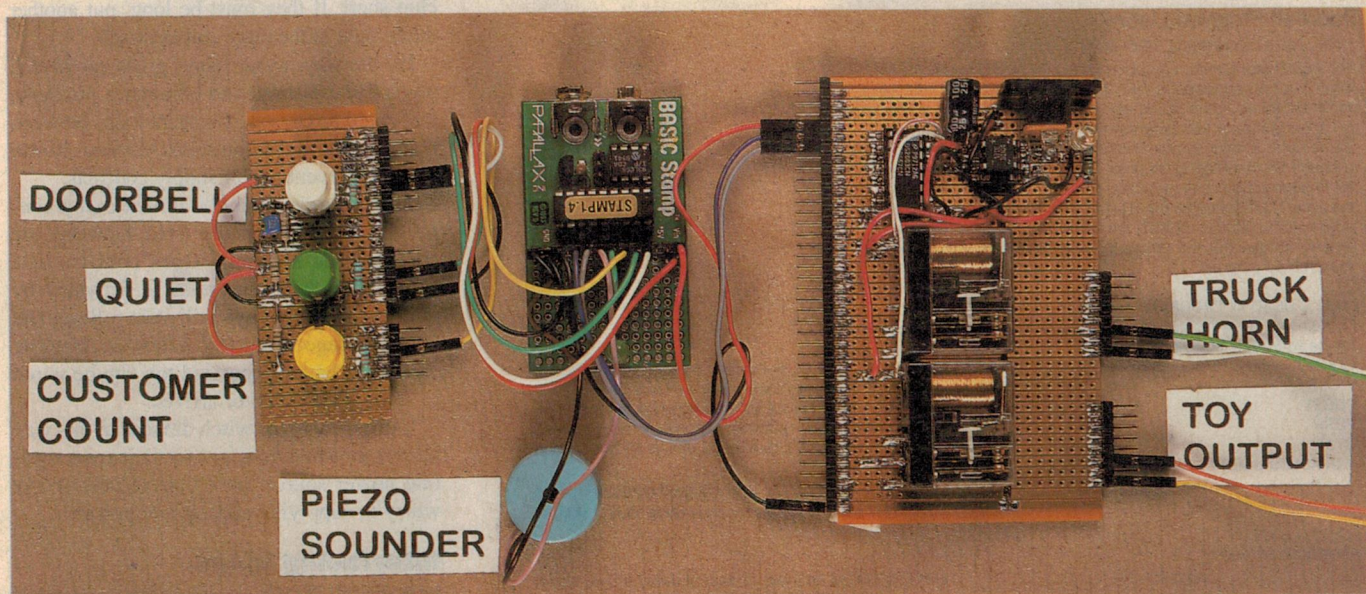
This idea, along with extra facilities is accomplished in program listing (1), written in PBASIC for Stamp1. The program is quite simple; if you examine the listing you'll find most of the program listing is comment or remark statements. Comments are ignored by the Stamp — in fact the Stamp never sees these; they are kept in your PC, and are only there to remind the program writer why that statement is there. (Don't laugh — I always appreciate my own comments when I come back to a program after a year or two.)

Of course not everyone has a lawnmower shop needing such a doorbell. But because the functions of this BASIC Stamp controlled doorbell are set in software, it can be set to make all kind of deci-



Here's the circuit for the basic version. Inputs from the pushbuttons or sensor switches connect to the Stamp's I/O pins 5, 6 and 7, while the relays operating the output devices are driven from I/O pins 1 and 2, via the ULN2003 chip.





The author built up the input and output circuitry on pieces of stripboard, connected here to the Stamp 1 module (centre) via some of his push-on jumper leads.

sions. You can change it to suit different occasions, or your own particular situation. In short, it provides an opportunity to 'design your own' custom doorbell. A BASIC Stamp is used to accept input, and take whatever action you may want when your visitors arrive...

Christmas is close, so you may want to tailor the doorbell to suit the Christmas season — play a Christmas tune, make a little Santa spring to life in your front window for a few minutes, make a lighting display go through its routine, or whatever.

Other events will come to mind too — birthdays, anniversaries, shop sales promotions, and family events, just to mention a few. With a flexible doorbell system controlled by a BASIC Stamp, you can change its behaviour quite easily to suit the occasion.

## Inputs and outputs

AS A FIRST step, let's think of the different ways we can activate our doorbell. We could use a simple pushbutton, or hide a magnet in a brass doorknocker to activate a reed switch under the knocker's striker plate. For auto sensing of visitor arrival we could fit burglar alarm type passive infra-red detector (PIR), a pressure mat that they walk on, a light beam detector, or a reed switch on the screen door.

It's simple to change the project's program listing, to handle these and many other different input arrangements.

On the output or 'action' side, we can program our doorbell to take many different actions in response to various input signals, or combination of those inputs. We could turn on some lights strung around the door, activate an animated toy, run a tape recorder to play some music, trigger a solid-state

message module to play a message, or turn a musical greeting card on.

With this project you really are free to use your own ideas and tailor the doorbell's capabilities for your occasion. You may elect to combine this project with others you've built in previous years, or build a new one like the Velleman Christmas tree mini kit.

Still on the topic of outputs, each of the Stamp's I/O pins is able to deliver 20mA at 5V, or to sink 25mA of current. While this is enough to drive an LED or a very sensitive relay, cost-effective and reliable relays require more current — ranging from anything between 400mA at 12V for a motor car

horn relay with a 30Ω coil to 60mA for a relay with a 200Ω coil.

Fig.1 gives a circuit for extending the driving current capability of the Stamp's outputs, using a ULN2003 solenoid driver chip. This will drive up to seven relays, with 500mA each, and take less than 3mA from each Stamp output to do that. Not that we are likely to need seven devices, but the wiring effort and cost of a ULN2003 is less than that associated with discrete components for only one channel. Just leave the unused channels disconnected.

The ULN2003 has internal back EMF protection diodes already wired for you, but keep the leads between relay coil and the ULN2003

## PIC chips and the BASIC Stamp

Made by US firm Microchip Inc., PIC controller chips are low cost controllers with a small instruction set, better than usual I/O current capability and low cost. All PIC chips will output up to 20mA and sink up to 25mA, allowing them to drive LEDs, loudspeakers, and even small motors directly. The maximum current for the whole chip is two pins' worth of current, and this may be budgeted over all pins, in terms of both time and current share.

One-time programmable (OTP) PIC chips, programmed in machine code, are used for cost-effective designs where a controller is to be embedded permanently into equipment. However these present a problem for developers, as OTP chips are just that — should your program not work, the garbage bin is the only place for a programmed OTP chip. For development work Microchip therefore makes quartz window, erasable versions of their chips, which are however fairly expensive.

Another solution is the 16F84, which has flash memory for program storage and thus allows programs to be rewritten.

All PIC chips have a special security feature — a code protection bit, which when set only allows

the stored program to be read in a garbled form. The 16F84 has this bit also, and when it is set attempts to read the program will fail. Clearing the protection bit in a 16F84 results in the program in the chip being erased, leaving room for a new program.

Parallax Inc's BASIC Stamps are special versions of the PIC chip. For example Stamp 1 is an OTP PIC16C56/20, programmed with a BASIC interpreter, and assembled on a small printed circuit board with an EEPROM for user program storage.

The Stamp has its own power supply with 50mA spare for user circuitry, a ceramic resonator, and a brownout detector/reset circuit. Eight of the 12 I/O pins are brought out to allow their use in controller applications. The remaining four I/O's are used to communicate with the program storage EEPROM, and for bi-directional communication with the user's PC. To conserve current one I/O pin sends 5V to the EEPROM only when it is used. This means that when put to 'SLEEP' the Stamp pulls only around 2uA, compared to 2mA when it's working. This excludes any current being supplied by I/O pins.



## Doorbell Program Listing

## INTELLIGENT DOORBELL PROGRAM

For BASIC Stamp with various options. To turn a function off simply put an apostrophe ('=REM) at the beginning of the line(s) for that option; the program ignores any commands in a line after an apostrophe. In this program there are some lines with an apostrophe already in place; these lines have been used to mark a space for inserting extra lines if you want to use extra gear. Write your option in those lines. REM lines stay in your PC; they are NOT loaded to the STAMP and do not use up program space in the Stamp. DEBUG lines are only for initial testing. When you have got the program going disable all debug lines, then reload program.

## LABELS USED IN PROGRAM

To help you trace through the program we have used names for our labels with fairly obvious meanings:

DOGGO  
WOOF  
PUSSY  
PURR  
STAT

## VARIABLES USED IN PROGRAM

W1  
W2

watching for initial visitor routine  
make loud noise eg truck horn routine  
watching for visitor during quiet routine  
make quieter noise, customers already in shop routine  
send customer count in W1 to a serial device @ 2400 Baud  
accumulated customer count  
used to count for time delay during PUSSY

Program now begins...

input 7  
input 6  
input 5

'Pin 7 is set as an input to accept caller arrival signal  
'pin 6 is set as an input force quiet timing  
'pin 5 is set as an input, to send serial listing to PC  
'pin 4 is used for output - "quiet time" warning LED  
'pin 3 is used for output - piezo sounder  
'pin 2 is used for output - toy, tape, Greeting card etc.  
'pin 1 is used for output - truck horn  
'pin 0 is used for serial output - customer count

DOGGO:

debug "DOGGO",CR

LOW 4  
LOW 2  
LOW 1

IF PIN7 = 1 THEN WOOF  
IF PIN6 = 1 THEN PURR  
IF PIN5 = 1 THEN STAT

GOTO DOGGO

PUSSY:

HIGH 4  
FOR W2 = 1 TO 10

'proprietor out back working, shop empty  
'show we are in doggo  
'make sure quiet mode LED is off  
'make sure device on relay 2 is off  
'make sure truck horn is off  
'customer has arrived, goto big noise  
'set to quiet mode, increment W1  
'send customer count to other device  
'repeat doggo loop, ie keep watching  
this routine assumes customers in shop  
'turns on LED to warn in quiet mode  
'count to a number (units of 1 sec)  
low time is set for working on program

DEBUG "DELAY = ",#W2,"PROGRAM in PUSSY:",CR

PAUSE 500

IF PIN7 = 1 THEN PURR

PAUSE 500

IF PIN7 = 1 THEN PURR

NEXT

GOTO DOGGO

WOOF:

W1 = W1 + 1

DEBUG CR,"CUSTOMERS from WOOF:",#W1,CR

HIGH 1

PAUSE 2000

LOW 1

'insert routine for christmas lights, santa, etc here if required  
SOUND 3,(50,10,60,10,70,10,80,10,90,10,100,10)

GOTO PUSSY

PURR:

debug

"PURR",CR

W1 = W1 + 1

DEBUG CR,"CUSTOMERS from PURR:",#W1,CR

'insert routine for christmas lights, santa toy, etc here if required

SOUND 3,(80,10,50,10)

GOTO PUSSY

STAT:

DEBUG "SENDING SERIAL DATA",CR

SEROUT 0,N2400,(#Customer count= ,W1)

GOTO DOGGO

'output at 2400baud N81  
'back to normal routines

NOTE: to reset customer count, restart Stamp  
also customer count will be lost if power fails

chip short. If they must be long, put another diode right at the relay coil terminals.

By the way, using relays gives useful and protective isolation, and eliminates problems that could be caused by current loops between our Stamp and the controlled devices. It also helps to prevent power supply conflicts.

Tape recorders may be turned on by connecting a remote pause lead between the common and Normally Open contacts of a relay. Then when the relay is activated by your program the tape will start rolling, and your message is played. Likewise greeting cards or a battery operated toy can be wired to start, when a visitor arrives.

Using a relay to switch devices in this way allows those devices to use their own separate power source, and relieves you of any worry in supplying appropriate power.

## Interfacing Ideas

SOME OF YOU may want to control a battery operated tape recorder or CD player from this doorbell, but are hesitant about directly wiring to their equipment. A simple minimal-intrusion interfacing method is shown in Fig.2, where wires are soldered to each side of a small piece of double sided, blank printed circuit board. These wires are connected to the appropriate doorbell relay contacts and the piece of printed circuit board is pushed into the cell stack of the battery operated equipment.

When the equipment's normal power switch is turned on, the battery supply circuit is only completed through the doorbell relay. So the doorbell now has control of the player or recorder, but you've made no permanent changes or modifications. The PCB 'break-in' gimmick can be removed at any time to restore normal independent operation.

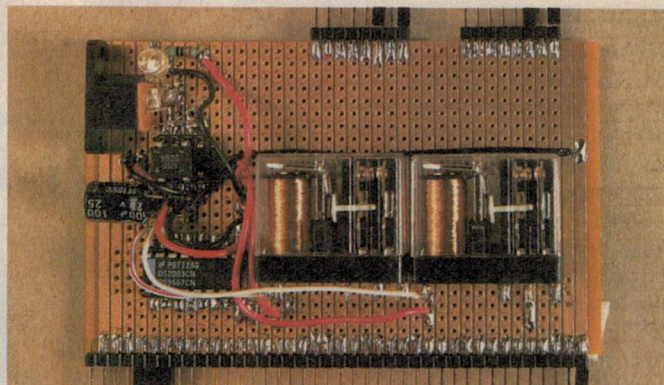
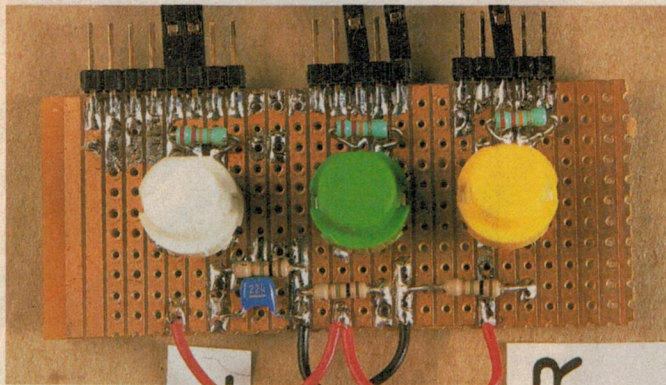
Other devices that our doorbell could be used with — and made to control in the same way — are the many animated toys available on the market now, like Santa Clauses, Teddy bears and dolls.

There is one device on the market that may be more useful than it seems at first glance: the 'motorised lollipop'. For a couple of dollars these have a battery, motor, and a two stage worm-drive gearbox. They're ideal for rotating small decorations on a Christmas tree...

Getting inside these lollipops to add wiring is easy. You just pull the label off, undo a screw, or lever clips open. Wiring direct to the motor, and fitting a battery outside, is far more convenient, and allows one to power it from a larger 1.5V volt cell.

Should your 'lollipop' rotate too fast for your liking, a series 1Ω or 2Ω resistor is adequate. Most of these motors are inefficient and pull quite a bit of current — so give them only short bursts of action in your program. You could even use more than one and sequence them, for an excellent effect.





These closer looks at the author's input circuitry (L) and relay driver board (R) show how simple they are to make.

## Low voltage only!

IN THE INTERESTS of safety (yours!), I strongly recommend that this project ONLY be interfaced with devices operating from low voltage — never to equipment running on mains electricity. If you want to turn lights on, use many of the low voltage strings available these days.

Should you want to light up your garden path, why not use one of those 12 volt garden systems. Put a reed switch and magnet combination on your front gate, to trigger the doorbell, and then via a heavy duty 12V relay it will be able to turn on your garden lights, have Santa Clause perform, animate a manger scene, and play carols from your tape recorder or CD. You can do any or all of these things, in any desired sequence or all at once. The choice is yours...

## Equipment needed

Now that you've hopefully been able to work out what kind of input(s) you want your doorbell to respond to, and the output devices it's going to control, we're ready for the next step. That's getting your program into the

BASIC Stamp chip, to make it all happen.

To program the Stamp you'll need an IBM-compatible computer with at least DOS 2.0 (or later), 128KB of memory and a floppy drive. Anything exceeding these specifications is bonus, so virtually any IBM-compatible is going to be fine.

The Stamp 1 & 2 Programming Kit contains a 450-page instruction book, with at least a page for each command along with editor commands and Stamp programming examples. There are also two programming cables and a disk with program editing and downloading software. The BASIC Stamps themselves are bought separately, to suit your requirements.

Programs written with the STAMP1.EXE editor will execute any command in the Stamp repertoire and control any of the eight I/O pins. Although the program is written in BASIC, the PBASIC language is quite sophisticated; it's capable of serial input and output routines for transfer of data between Stamps, or Stamps and other computers. Stamps can output a pseudo analog signal, as PWM (pulse-width modulated) DC, and are able to read resistance connected to any pin.

As previously pointed out, the Stamp program is stored in internal EEPROM, and they are able to store lookup tables and store data in the same EEPROM. This happens in spare capacity, and program writers have to be careful that data storage isn't allowed to overwrite their program.

It's not possible to extend program storage memory, because the Stamp1 interpreter will only read the resident EEPROM for instructions, and running any sort of swap file arrangement would shorten EEPROM life. However it's possible to use external memory for storing extra data and lookup tables, and there are application notes in the programming package explaining how this can be done.

Once your program is written on your PC, downloading it into the BASIC Stamp is very easy, once the Stamp module is connected to the PC's printer port via the appropriate cable. You download the program from the STAMP1.EXE editor simply by typing <ALT><R>. The downloading takes around a second. The Stamp editor checks errors, and if all is OK the program is downloaded and runs immediately. Should the program not work in the way you intended, just edit and repeat the <ALT><R> command.

Once the program is loaded into the Stamp, it will run whenever it is turned on, with a memory rated retention of 40 years.

The only exception to this is the DEBUG command. The command

**DEBUG variable,[variable]**

will only send the content of variables the first time a program is loaded and run.

## Using existing doorbells

SOME READERS may want to use an existing doorbell setup in conjunction with this project. For instance you could hook it up to a wireless doorbell, a PIR sensing type, conventional 'ding dong' type, or even an old fashioned bell or buzzer.

Interfacing is very straightforward if the existing system uses a piezo sounder, loud-speaker, or almost any annunciator. Simply connect one of the Stamp inputs across the

## BASIC Stamp versions, and what's available

There are a number of different BASIC Stamp modules and support products. To avoid confusion, here's a quick rundown:

The BASIC Stamp 1 version D module uses conventional leaded parts on a PCB measuring 62 x 38mm, with almost half the PCB available for your own prototyping. It's now available from Dick Smith Electronics as Cat. No. K-1400 (\$79.00).

The Stamp 1 version E (DSE K-1401, also \$79.00) uses SMT parts and is on a much smaller PCB with pins along one side, compatible with SIL socket strip. There's also a matching 'carrier board' available for it (DSE K-1402, \$39.00). Both of these interface with your PC for program downloading via a cable to the parallel printer port.

The Stamp version 2 (DSE K-1404, \$109.00) also uses SMT parts, but is on a tiny PCB with a 'dual in line' pin arrangement. There's another matching carrier PCB for this (DSE K-1403, \$49.00). The Stamp 2 interfaces with

your PC via a cable to a serial RS-232C port.

The interface cables don't come with the modules themselves, but both are included in the Stamp Programming Development Kit (DSE K-1405, \$149.00). This kit also includes a 463-page *BASIC Stamp Manual*, the Stamp program writing/editing/downloading software to run on a PC, and three months of technical support (via Australian distributor MicroZed Computers).

Note, however that the content of the programming manual is actually available on the Parallax Inc website ([www.parallaxinc.com](http://www.parallaxinc.com)), and can be downloaded as a PDF file. Also available from the site is the Stamp program editing software and wiring details for the interface cables, if you wish to make your own.

DSE is also making available a set of 12 miniature jumper leads for use in Stamp projects, as shown in the photos (DSE K-1406, \$9.95), and also the parallel interface cable by itself (K-1407, \$19.95).



sounding device, with the same 22k and 1M resistor network as shown for the pushbutton. There is usually enough voltage swing to trip the Stamp's input circuit. But do make sure you have at least 22k in series with the Stamp's input, and that there is a common 'earth' connection.

Should you be using a DC bell or a 'ding dong' doorbell, you will need to make sure the polarity matches the input statement in the sample program — i.e., the line 'IF PIN7 = 1' may need to be changed to 'IF PIN7 = 0'.

Should there not be enough voltage swing out of your existing doorbell, or you are uncertain about earth connections and polarity, try using an isolation transformer. The transformer might be an audio interstage transformer out of an old transistor radio, or a line transformer taken from an old modem.

### Support & extra ideas

IF THERE ARE any corrections or changes to the information presented in this article, or any extra ideas for using the project, I'll be posting them on MicroZed Computer's Web pages (<http://www.microzed.com.au>). So if you're on the Net, that will be the first place to look for further support.

(Those who buy the BASIC Stamp Program Development Kit can also obtain specific support by email, from [support@microzed.com.au](mailto:support@microzed.com.au))

That's about it. I hope this project will make your Christmas more interesting, and when it has finished its Christmas duties it can be put to work throughout the year. Thanks to the BASIC Stamp's ability to be easily reprogrammed to change its function, you'll be able to use the project for all kinds of other applications — or just use it for a more interesting doorbell, if you prefer. ♦



'Animated Santa' figures like that at left are easily controlled from one of the Intelligent Doorbell's relays, simply by connecting a wire to each side of a small piece of blank double-sided PCB laminate, which is slipped under one end of a cell in the figure's battery compartment...

### PARTS LIST

#### Basic requirements

You'll need an IBM-compatible PC with at least 128KB of memory, a 3.5" floppy disk drive and DOS 2.0 or later, and a temperature-controlled soldering iron and 60/40 flux cored solder. To make the basic Intelligent Doorbell you'll also need:

- 1 Parallax Stamp development kit (DSE K-1405), or the Parallel Interface Cable (K-1407)
- 1 Parallax Stamp 1 module (DSE K-1400)
- 1 ULN2003 relay driver IC (DSE Z-5380 or equiv.)
- 1 12V relay (i.e., DSE P-8010) — one per output
- 1 1N4004 rectifier diode (DSE Z-3204) for each relay
- 1 22k 1/4W resistor (one per input)
- 1 1M 1/4W resistor (one per input)
- 1 0.22uF capacitor (one per input)
- 1 LED and series resistor (470 ohms — 1k)
- 1 Piezo sounder (DSE L-7022 or equiv.)

Also versa strip board, various pieces as required (DSE H-5614); and perhaps a project box to suit — one from transparent plastic is ideal as LEDs mounted on stripboard can be seen without drilling holes (DSE H-2953).

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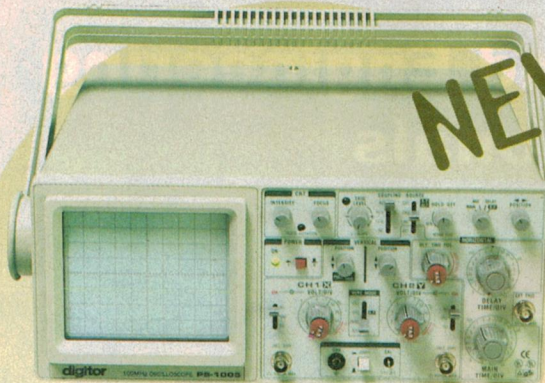


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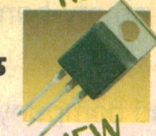
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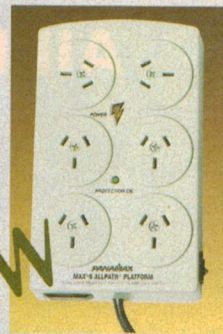
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**EA** Dec '98

NEW



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- Can be used with any digital multimeter
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- Range of probe supplied: -4°C to 250°C
- Connects to your digital multimeter via flying leads and banana sockets
- Operates on 1 x AA, 1.5V DC and 1 x 9V DC battery
- Comes with case, front panel label, battery clips PCB and all components

K 7120

**\$39<sup>95</sup>**

Actual product may differ from image shown

**SILICON CHIP** Dec '98

NEW



### Engine immobiliser Mk II

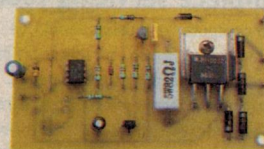
- Circuit stalls engine when activated
- Connects directly to ignition system
- Kit can be assembled and used independently
- Can also be interfaced with control module (keypad) to be released shortly
- Power supply: 12V DC
- Includes all components, case and PCB

K 4303

**\$39<sup>95</sup>**

**SILICON CHIP** Dec '98

NEW



### Shorted turns tester

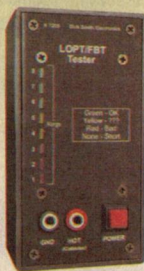
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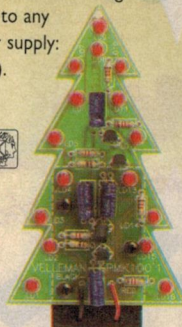
### Christmas tree kit

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- With extra safety features
- Comes with all components, hardware, PCB, case, pre-punched and screened front panel

K 5418

**\$54<sup>95</sup>**

**EA** Oct '98



### Motorcycle intercom

- 2-way communication
- Full duplex operation
- Single volume control for both channels
- Uses 4 x AA batteries or power directly from motorcycle
- Includes all components hardware, PCB, deluxe case and pre-punched screened front panel

K 6021

Accessories not included

**\$39<sup>95</sup>**

**EA** Jul '98



### Soundcard pre-amp

- Convert your soundcard into an oscilloscope or waveform generator
- Take full advantage of your soundcard's input capabilities for making measurements
- Includes software to get you started!
- With all components, hardware, PCB, case, pre-punched and screened front panel

K 7347

**\$34<sup>95</sup>**

**EA** Aug '98



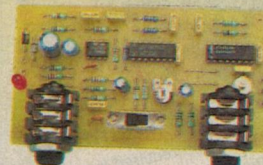
### Wah-Wah guitar kit

- Popular guitar effect is controlled by a foot pedal (not included)
- Resulting sound produces suddenly increasing/decreasing volume
- Includes PCB stakes, PCB, components and PCB mounted 6.75mm sockets.

K 5620

**\$29<sup>95</sup>**

**SILICON CHIP** Sep '98



Direct Link is equipped with the service centre to supply you with a hassle free delivery direct to your door. PHONE 1300 366 644 to reserve your order

Availability: Our kits consist of many different parts from numerous suppliers. Whilst we have consulted closely with them and are satisfied as to their ability to supply, sometimes problems can arise in obtaining all of the parts. This means there is a slight chance that availability may be delayed. Rainchecks are available, however if you'd like to check beforehand, please don't hesitate to contact your local store.



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on bits, tools and accessories?

## 32pc security bit set

For use with equipment with security screws. Includes Torx, security Hex, Tri-wing, Hex and spanner pin drive bits. In a soft plastic case.

T 4506

**\$16<sup>95</sup>**

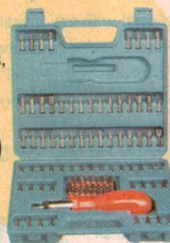


## 101pc bit set

Includes a hard plastic carry case, driver handle and magnetised bit holder. Features flat blade, Phillips, square, security Torx, Tri-wing, spanner, torque bits and more.

T 4513

**\$36<sup>80</sup>**

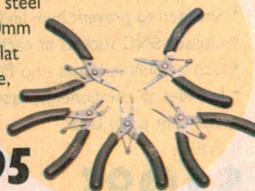


## Micro-precision plier set

Spring-loaded micro pliers/nippers with fully insulated handles. Quality stainless steel construction. Includes 90mm cutting nippers, 100mm flat nose, 100mm round nose, 100mm bent nose and 100mm long nose pliers.

T 3575

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## 16-piece servicing tool kit

No computer enthusiast should be without one. Tough, durable tools in a compact zippered case. Includes IC extractor, inserter, Pearl Catch, wire cutters, driver handle, 1/4" hex driver, 3/16" hex driver and more.

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Suitable for carrying sensitive test equipment, cameras, notebook computers and electronic tools.

480(L) x 326(W) x 150mm(H)

Tools/accessories not included

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Clip this pointer to a belt or keep it in your pocket! 1mW laser pointer in tough metal housing, only 5cm long. Up to 50m indoor range. Includes batteries.

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9mm Zn T8 10-pack H 1102  
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**\$350 per pack**

TO-264 Transistor Insulator

Mica washers to suit TO-264 transistors.

H 1938

**\$1<sup>95</sup> pk of 4**

Round TO5 heatsink

H 3412



**85¢**

1mm square wire wrap pin

Pack of 25.

H 5595

**\$250 pk of 25**



9.5mm Self-Tap Security Torx screws

Pack of 20.

H 1100

**\$450 pk of 20**

Hex brass spacer 9mm/4BA

Pack of 6.

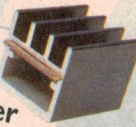
H 1842

**\$295 pk of 6**

Snap-on TO-126 heatsink cooler

Snap-on heatsinks to suit TO-126 type plastic power transistors. Simply snap over the transistor. Install in seconds. Thermal resistance 55°C/W.

H 3417



**\$325**

Adhesive rubber magnet-

150 x 80mm

H 6030

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Flexible Grommets  
Easily cut to required length.  
1.0mm x 2m long H 1720 \$3.50  
1.5mm x 2m long H 1721 \$3.75  
2.4mm x 2m long H 1722 \$3.95  
from **\$350**

Aluminium box - 133 x 76 x 54mm

Economical and easy to work with! Made in two sections. Complete with screws.

H 2325

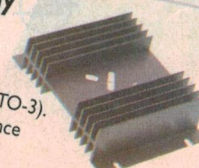
**\$1050**



Economy power heatsink

Predrilled (1 x TO-3). Thermal resistance is 2.8°C/W.

H 3474



**\$695**

Mini PCB mount battery terminal

10 x (+VE) and 10 x (-VE) terminals.

H 2493

**\$295 pk of 20**



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### Electromagnetic field tester

This EMF tester is a cost effective, hand-held instrument providing you with a quick, reliable and easy way to measure electromagnetic field radiation levels generated by power lines and cables, computer monitors, TV sets, video equipment and many other devices. With 3.5 digit (LCD) display, range of 0.1m to 199.9m gauss and 30Hz to 300Hz bandwidth.

Q 1225

**\$99** **SAVE \$50!**



### Digital light meter

Ideal for photography, darkroom and video use. Quickly and accurately measures up to 50,000 lux over 3 ranges. Features auto-zero function, low battery indicator and carry case. Requires 1 x 9 volt battery.

Q 1400

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VIC	Altona Gate	Altona Gate S/C Millers Rd	9314 6611
	Carnegie	1048 - 1054 Dandenong Rd	9569 2644
	Greensborough	Shop 2, 16-22 Main St	9432 5125



That's where you go!



# Tiny Shielded Resistance Box

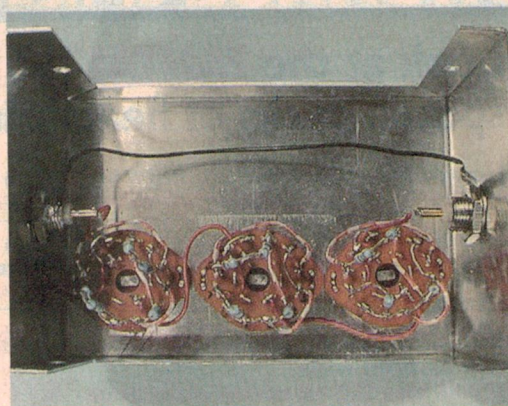
**Need a shielded resistance box for measuring the input resistance of circuits and equipment? Here's a very compact and also very low cost design you can knock up in an afternoon. You could also use it as a conventional resistance substitution box.**

by Jim Rowe

**S**OON AFTER BUILDING the prototype of my Recording Front End for PC sound cards (September 98), I needed to measure the input resistance of the sound card in my own PC — which, judging from the bass-end response I was getting, seemed to be rather lower than the typical 40k $\Omega$ .

Of course the simplest way of measuring the input resistance in this kind of situation is to set an audio generator (with a very low output impedance) to a suitable signal level, and then add resistance in series with the generator while monitoring the level at the device input. When the signal level drops to half its original value (-6dB), the added resistance will be very close in value to the input resistance of the device.

So essentially all you need is a variable and preferably calibrated resistance; but if



*Inside the prototype. There's so little involved that a PCB wasn't justified.*

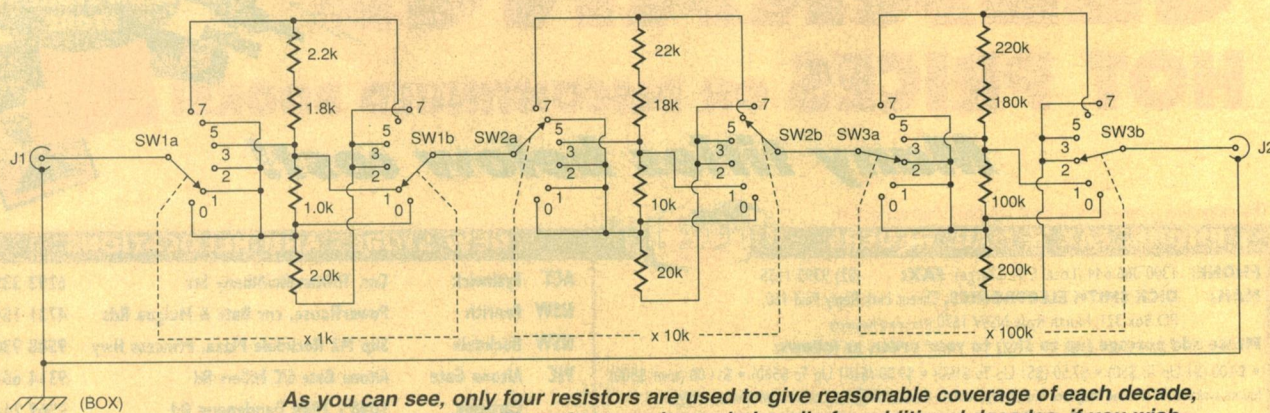
you're going to measure the input resistance of fairly sensitive circuitry the variable

resistance should also be shielded, to prevent pickup of hum and RF interference. Which tends to rule out those cheap little resistance substitution boxes, and many of those lovely old laboratory decade boxes...

In my case, I realised that what I needed (but hadn't ever got around to making myself) was a compact shielded decade box. It should cover around three decades, up to around 500k $\Omega$  or so, but didn't have to provide a complete kilohm-by-kilohm capability like a traditional decade box — just cover the range with reasonable resolution.

Of course it also had to be easily assembled, in a minimum of time and using the smallest number of readily available bits. So that was the challenge...

Looking through the catalogs, I was reminded that the days of multi-pole many-



*As you can see, only four resistors are used to give reasonable coverage of each decade, using a 2 x 6 switch. The values can be scaled easily for additional decades, if you wish.*





Here's the resulting box, very close to actual size. You could fit additional decades in the same box, if you wish.

position switches are long gone. With the switches now readily available, there were really only two options: either use a single pole 10-position switch for each decade, with the appropriate number of resistors, or go for say a two pole six-position switch for each decade, with a bit of ingenuity to whittle down the number of resistors needed.

I wanted to use the 'open' type of rotary switch rather than the more popular sealed plastic type, because my impression is that the open type has contacts with a somewhat better self-cleaning wipe action. But the open type currently aren't available with more than six positions, so that settled it — I would go for the six position option.

As you can see from the schematic, the arrangement I settled on uses a 2 x 6 switch and just four 1% resistors for each decade. The switching gives values of 0, 1, 2, 3, 5 and 7 in each decade, using resistors with normalised values of 1.0, 2.0 and two values which add up to 4.0 (you can use either 1.8 and 2.2, or another two of 2.0 if you prefer).

I've used three decades, with the first giving units of 1kΩ, the second units of 10kΩ and the third units of 100kΩ. Together they cover from 1kΩ to 777kΩ, reasonably smoothly and with no large 'breaks' — quite well enough for most input resistance measurements. And with only 12 resistors, instead of 27.

Of course you could add further decades, if you wish. For example adding another 2 x 6 switch and resistors in 100Ω multiples (i.e., 100Ω, 200Ω, 180 and 220Ω) will extend the coverage down to 100Ω. In principle the idea is quite extendable, in either direction.

I fitted everything inside one of the small aluminium utility boxes (100 x 70 x 50), as

you can see. It would even have fitted inside the *smallest* standard box, actually. You'd be able to fit at least one more switch decade into the box I used, if you're careful.

I didn't bother producing a printed circuit board, as the wiring is so simple. The four resistors for each decade are simply tacked onto the back of each switch, after the rest of the wiring has been made.

To facilitate making input-resistance measurements, I fitted a BNC socket at each end of the box and wired all of the switches in series between the two active lugs. The earthy sides of the sockets are connected via the box itself, with an added wire just to make sure.

*Voila* — a tiny but very practical shielded resistance box, which uses easily obtainable bits and can be knocked up on a Saturday afternoon. It did the job for me, anyway, and now it's made there should be one less interruption to project development in the future...

By the way if you need to use it as a traditional resistance box with a single port, all you need do is connect a shorting plug to one end. Or fit a shorting switch inside, to perform the same function. ♦

## PARTS LIST

### Resistors

(All 1/4W, 1% metal film)

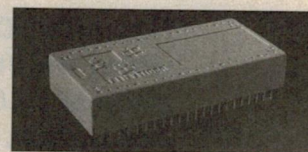
For three decades: one each of 1.0k, 1.8k, 2.0k, 2.2k, 10k, 18k, 20k, 22k, 100k, 180k, 200k, 220k.

### Miscellaneous

3 x two pole, six-position rotary switches; 2 x BNC sockets, single hole mounting non-insulated; 1 x metal utility box, 100 x 70 x 50mm or 100 x 60 x 45mm; 3 x small instrument knobs; hookup wire, solder etc.

# THE TIGER COMES TO AUSTRALIA

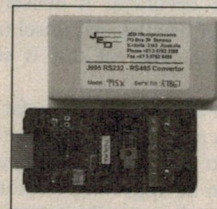
You've seen the BASIC Tiger and Tiny Tiger advertised in the US magazines: they are now available in Australia from JED.



Tigers are modules running true compiled (not tokenised), Multitasking BASIC at 20 Mhz, but only draw 45mA. They have memory, 4 x 10-bit analog inputs, digital I/O, two serial ports, RTC, and are superb small controllers for scientific and industrial applications. **A Tiger with 128kB FLASH, 128kB CMOS RAM and RT clock costs only \$162.** A development system (W95), with a proto board, is only \$275. JED has a local board/controller with LCD/Kbd and industrial I/O.

See our [www](http://www.jedmicro.com.au) site or call for data sheets.

## RS232 to RS485 Converter



The small plastic case 100mm by 55mm by 25mm is an Australian-built RS232 to RS485 optoisolated converter. It connects a PC or PLC RS232 serial port to a multidrop RS485 differential cable up to 4,000 ft long.

The J995X converter has an internal microprocessor to automatically connect the transmitter to line, so the user program need not use the RTS line for RS485 TX control.

**Cost \$160 plus \$20 plug pack.**

**\$300 PC-PROM Programmer**  
**Also: \$145 Eraser with timer.**

This programmer plugs into a PC printer port and reads, writes and edits any 28 - pin or 32 pin PROM without needing special plug-in cards.



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(prices do not include freight or sales tax.)



# \$10 Wonders

## 18 — Sparkling Christmas lights

**Ho ho ho! Christmas is here, and so we're presenting a Wonder project which will (we hope) capture the Christmas spirit for less than our maximum price of \$10. These sparkling lights are perfect for that little tree or decoration, and the number of lights can easily be increased from the eight shown here to 24 or so, depending on your application.**

**T**HIS PROJECT is intended for lighting, among other things, a miniature artificial Christmas tree. Although there are dozens of kinds of lighting sets available for full-sized trees, we have not found a single set suitable for our tiny tree. It is only 30cm tall and we decorated it densely with an assortment of baubles and tinsel (all gold or silver); but in spite of this it still lacked sparkle.

Lamps of the usual size are far too big to put on such a tree, but LEDs are just about right, and so this circuit is designed to flash the LEDs in an appealing fashion. The circuit diagram shows it flashing eight LEDs, which is probably enough when reflected in the other decorations, but you can double or treble the number if you wish.

This is not the only use for a flashing array of LEDs, of course. It makes an attractive centrepiece for the dinner table if you just dump the nest of wires and lights in a large glass bowl or magnum-sized wine glass. The effect is more elegant if the glass is softly coloured.

In the past we have used a similar circuit to enhance an Advent Calendar. We punched small holes at various places on the picture and pushed LEDs through from behind. It added an enchanting seasonal glitter.

### How it works

THE CIRCUIT is driven by two 'clock' oscillators, each built from a pair of NAND gates (Fig.1). Their circuits are not quite identical, but they both operate in almost the same way. The frequency of each oscillator is given by  $f = 1/2.2RC$ , where R is the resistance of R1 (or R3). This gives a frequency of about 2Hz for the upper oscillator and about 9Hz for the lower one.

The idea of having two clocks is to disguise (as far as possible) the fact that the sparkle is driven by a digital circuit. You can choose whatever frequencies you like and calculate suitable resistor and capacitor



**See 'em twinkling away... By using a dual BCD counter and having the two sets of lights running at different speeds, the flash rate of the LEDs isn't constant and so the flashing looks quite random.**

values accordingly.

This is a good chance to use up two of your odd-value capacitors that have been hanging around in the scrap-box for too long. Our 0.22uF electrolytic is in this category. The display will look just as good with a 0.47uF, or even another 1uF capacitor. No two electrolytics of the same nominal value ever seem to have the same capacitance, and the main point here is to run the clocks slightly out of sync. You can use tantalum or polyester capacitors as well, of course.

If you vary R1 or R3 to change the frequency of the circuit, just remember that the second resistor in each oscillator (R2 or R4) should have a value around 10 times that of the one you changed.

The outputs from the two clocks go to two BCD (Binary Coded Decimal) counters, which are both in the one chip, IC2. These counters produce a repeating sequence of outputs representing binary 0000 (=0) to 1001 (=9). This gives 10 different output states from each counter and, since the clocks are not synchronised with each other, an essentially random appearance to the flashing LEDs.

Each of the counter outputs goes to a conventional transistor switch used to drive the LEDs. The value of the transistor's collector resistor is chosen to limit the current through each LED to about 15mA, which gives a suitable level of brilliance. Reduce the resistor value if you want brighter LEDs, but don't go too far or they'll burn out. Allowing for the forward voltage drop across the LED (about 2V) and the collector-emitter voltage drop in the transistor (about 0.3V), this leaves  $6 - 2.3 = 3.7V$  across the resistor. So the resistor is calculated as  $R = 3.7/\text{current}$ . Use this formula if you want to wire a second set of LEDs in parallel, as indicated by the dotted lines. For example, two LEDs passing 30mA will need a resistor of around 120Ω.

If you increase the LED current you may also need to increase the base current by reducing the value of the base resistor to, say, 18k. The main point is not to draw too much current from the counter, because this could cause it to mis-count.

Afficionados of house frontage and rooftop displays will perceive that this circuit for miniature trees can also be used for large-scale illuminations. Instead of driving eight LEDs, use it to control eight relays and let these switch on as many lamps as you can safely handle. We are not giving



any specific instructions for this, but leave the design to your ingenuity — and the consideration of safety factors to your experience and common-sense.

## Construction

THE CIRCUIT layout (Fig.2) is compact so that it can be hidden behind the flower-pot in which the tree is supported. You will also need a battery box, for four D-type cells to power this number of LEDs for hours at a time over the Christmas season. The box and circuit board can be stacked behind the pot and shrouded in Christmas paper if you like.

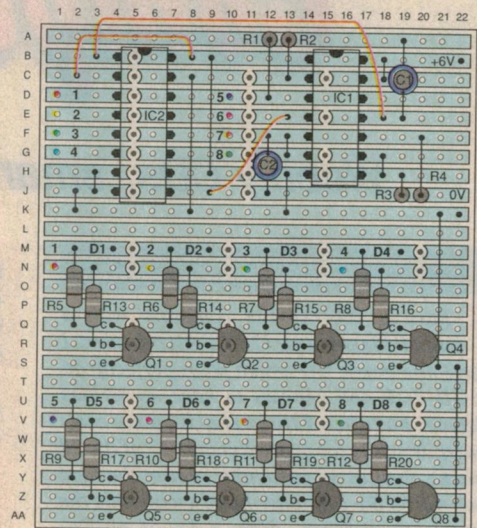
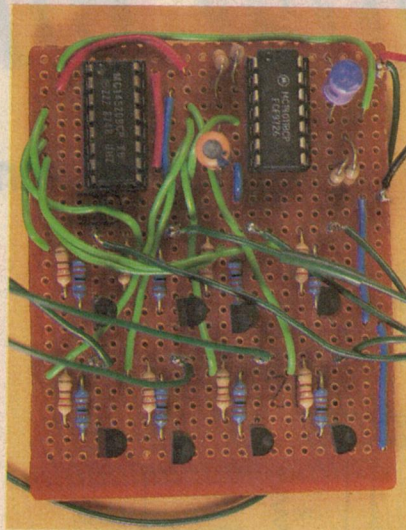
Build the clocks first (IC1) and check their outputs at pins 4 and 11. Note that the copper strips are NOT cut at B15, D15 and F13. Then add the counters (IC2). Use a meter (moving coil type preferred) to check that the outputs are toggling as expected. Wire up the eight transistor switches, taking care to isolate them from each other by cutting the copper strips where indicated in Fig.2. Solder connecting wires from the holes beside IC2 labelled 1-8, to the holes labelled likewise on the lower part of the board.

Cut three metres of flexible connecting wire into 16 pieces, each around 17cm long, and strip 5mm of insulation from both ends. The anodes of all the LEDs are connected together on to a single line which runs back to the +6V supply. Before the somewhat lengthy business of soldering the LEDs to the wires, it's a good idea to check which are the anode and cathode terminals. The standard arrangement is for the anode wire to be longer, and for the cathode to be next to the flat on the rim — but we have come across LEDs with exactly the opposite arrangement! It caused a lot of upset until we discovered what was wrong.

To solder the anodes, first cut both LED leads to 10mm long, and cut a 15mm length of sleeving. Push two connecting wires through the sleeving, twist their ends together and lightly solder them. Grip the anode wire in a heat shunt, then solder the twisted ends to the anode wire as shown in Fig.3 and slide the sleeving up over the join. If it is heat-shrink sleeving, warm it gently with the soldering iron. Repeat this until you have a string of eight LEDs. You can then solder the wires to the cathodes in a similar way.

When you've finished, solder the single anode lead to the supply pin (B22) and the cathode wires to the terminal pins on the lower part of the board. Which wire goes to which pin doesn't really matter.

You may prefer to install the LEDs on the Christmas tree before soldering the cathode connections, as things can get a bit tangled, and trying to intermingle the two three-dimensional networks of the wiring and the branching tree can sometimes make one wish that there was a fourth dimension to take employ (apart from time)... Merry Christmas! ♦



It looks a bit complicated in the photo, but Fig.2 (above) shows how the numbered outputs from IC2 connect to their correspondingly numbered points on the lower half of the board. The LEDs are connected to the points labeled D1, D2, etc, and don't forget to cut tracks R and Z, under the transistors.

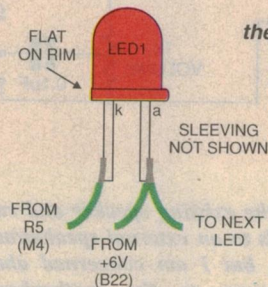
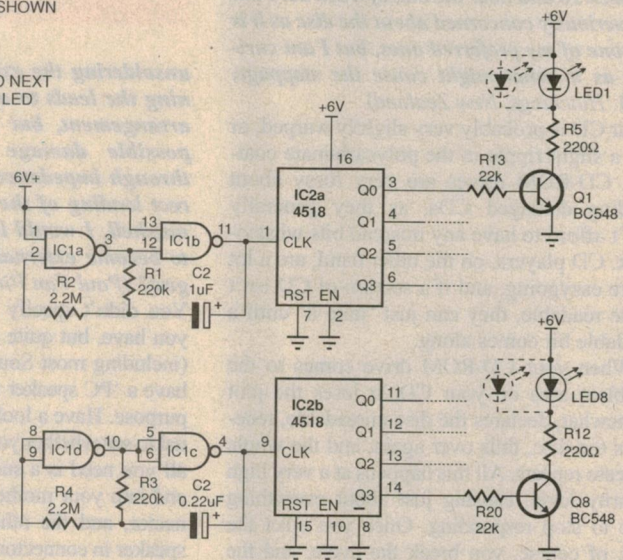


Fig.3 (above) shows the wiring to each LED, while Fig.1 (right) shows how simple the circuit really is. Two NAND gate oscillators clock the BCD counters, which in turn light LEDs 1 to 8 via the transistor buffer stage. Buffers for LEDs 2 — 7 have been omitted for clarity.



## Parts List

### Resistors

(all 5%, 0.25 W)  
R1, R3 220k  
R2, R4 2.2M  
R5 - R12 220 ohms  
R13 - R20 22k

### Capacitors

C1 1uF  
C2 0.22uF or more

### Semiconductors

D1 - D8 LEDs: any colour, size or shape

IC1 4011 quad 2-input NAND gate  
IC2 4518 dual binary counter/divider  
Q1 - Q8 BC548 NPN transistor (or similar)

### Miscellaneous

Stripboard 68mm x 58mm (26 strips x 22 holes); 10 x 1mm terminal pins; 3 metres flexible light-duty stranded wire, preferably with dark green insulation; 16-pin IC socket; 14-pin IC socket; 6V battery box (4 x D cells); 2.5mm plastic sleeving or heat-shrink tubing.



# Computer Clinic

## Wobbly CDs, smart drives & some seriously cool software

### Seedy-ROM

**I** have a 486DX4-120 computer with a Sound Blaster and 32x CD-ROM drive. I have one music CD which plays perfectly on a CD deck and appears to have no serious defects, but when I try to play it on my computer, it works for approximately 17 of the 20 tracks, then at no particular spot in the next two tracks the computer hangs, with only the mouse operational. After a lot of playing around I have found that if I eject the affected CD, everything goes back to normal. The surface of the disc appears to be little different from other disks with slight surface marks, and the stopping spot is not the same on each playing — it varies between the start of track 18 and near the end of track 20. I am not seriously concerned about the disc as it is not one of my preferred ones, but I am curious as to what might cause the stoppage. (P.A. Hutchings, New Zealand)

Your CD is probably very slightly warped, or has a slight ripple in the polycarbonate coating. CD-ROM drives are very fussy about reading damaged CDs, as they generally can't afford to have any misread bits whatsoever. CD players, on the other hand, are a lot more easygoing, and if a section of CD isn't quite readable, they can just 'fake it' until a readable bit comes along.

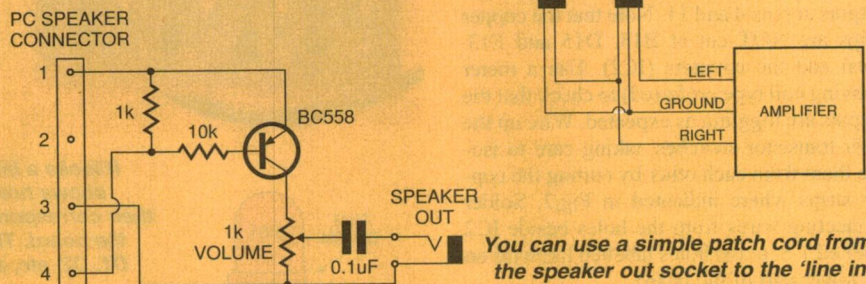
When your CD-ROM drive comes to the problem area on your CD, it loses the plot somewhat, declares the disc unreadable, re-detects the disc, falls over again, and the whole process repeats. All this happens at a very high priority level, causing just about everything else to stop responding. Once you eject the CD, of course, you break the cycle, and the system lets you get on with things.

One other thing to note is that different CD-ROM drives have different sensitivities, and a CD that is completely unreadable on one machine will often work perfectly on another. One computer magazine's coverdiscs are often virtually useless on my main machine, so I just put them in another computer on my network, and run them from there. A little cumbersome perhaps, but it does get the job done...

### External speaker

**M**y computer has a sound card that drives two external, powered speakers, and I would like to route the output from my internal PC speaker through these speakers as well. I had thought of simply

**Fig.1a (Below):** This circuit will convert the signal from your PC's internal speaker to a suitable level for an amplifier.



You can use a simple patch cord from the speaker out socket to the 'line in' input on your sound card, or wire up a Y-cable as shown in Fig.1b (Above).

unsoldering the existing speaker and running the leads to an external speaker/amp arrangement, but I am concerned about possible damage to the motherboard through impedance mismatching or incorrect loading of the existing circuitry. In a nutshell, I would like the internal speaker to become external. What would you suggest? (Paul Van Pinxteren, via email)

You didn't specify what type of sound card you have, but quite a lot of the common ones (including most Sound Blaster cards) actually have a 'PC speaker in' connector for this very purpose. Have a look in your sound card manual to see whether your card supports this. If so, all you need is a suitable cable. Just plug one end into your motherboard's speaker out connector, and the other onto your soundcard's speaker in connector, and you're in business. If not, it's time for the soldering iron...

Patching in the speaker signal would be quite simple if it weren't for the fact that the PC's speaker line is referenced to +5V. As it is, however, you'll need to build up the circuit in Fig.1. Once you've done that, mount the 3.5mm mono socket in a spare backplate or other convenient place.

If you want to use a separate amp/speaker for the PC speaker output, you can just plug it straight in, otherwise you'll need to build up a Y cable. Keep your normal audio out line on one branch, and put a mono 3.5mm plug on the other, with the tip wired to one of the signal lines, and the shank wired to earth. (See Fig.2 for details.) Good luck, and enjoy the thrilling world of 1-bit digital audio.

### SMART feature

**M**y new motherboard tells me that my hard drive has SMART support. Is this a built-in version of the SMARTDRIVE disk-caching program? If so, does that mean that I shouldn't load SMARTDRIVE in my AUTOEXEC.BAT in case it conflicts? (Andrew Tunn, via email)

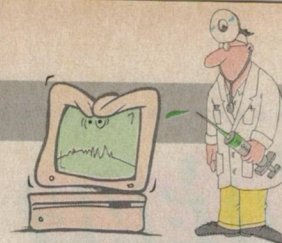
In a word, no. SMART has nothing whatever to do with the similarly-named SmartDrive disk cache, but rather stands for Systems Monitoring And Reporting Technology. With a SMART-capable drive and BIOS, and appropriate software, (such as EZ-SMART, US\$14.95 from Micro House Solutions, <http://www.micro-house.com>), you can be notified of impending hard drive failure, and take action accordingly. (Panic, gibber, run around in small circles, backup important data, etc.)

The way it works is rather interesting: hard drives don't usually fail all at once, but tend to degrade slowly over the years. For example, if the main motor bearings start to wear, the spin-up time increases; if the servos get out of whack, you start getting increased seek time as the drive fumbles about looking for the correct track, and so on. Faults such as these tend to gradually worsen, until finally the poor drive can't take it any more, and you end up with a dead or barely useable drive.

All SMART does is to monitor various parameters, such as error rates, calibration retries, etc., and notify the operating system if things take a turn for the worse. Rather like having Death constantly looking over your



Got any computer queries? Whatever is bugging you, from hardware problems to C programming, send it in and we'll soon have you fixed up. You can email your question to [electaus@magna.com.au](mailto:electaus@magna.com.au), or fax or mail it in to us here at EA.



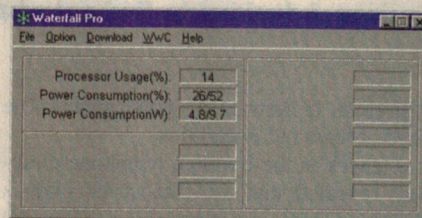
shoulder. Your fate may be sealed, but it can be handy to know about it beforehand...

### Cool stuff!

Now to something I just came across this week, and wanted to tell people about. There are a lot of emulators around at the moment, providing virtual versions of just about everything from an Amiga 500 to a goldfish. What you may not have seen, however, is a software emulation of a CPU cooling fan.

Amazing as it may seem, Waterfall Pro from Leading Wintech can actually reduce the operating temperature of your CPU, helping to overcome heat buildup due to insufficient heatsinking or airflow, or to increase the margin of safety when overclocking your CPU. What's more, it reduces power consumption for increased laptop battery life, and even optimizes your CPU for better performance.

So how does this miracle of modern technology work? Simple! Waterfall runs in the background, at the lowest possible priority (so as not to interfere with any other tasks), and constantly sends HLT instructions to the CPU.



These HLT instructions do precisely nothing, and so (I'm not kidding, honest!) require less power to perform. Less power consumed means less heat generated, and some users have reported cooling of up to 30 degrees!

With the cooling that Waterfall provides,

laptop users may even be able to do away with their CPU fan altogether, extending battery life still further.

I haven't personally had time to verify all of these claims, but if you want to try it for yourself, check out the Leading Wintech website at [http://cpu.simplenet.com/leading\\_wintech/](http://cpu.simplenet.com/leading_wintech/).

### FAQs and index

I'm also working on a little Christmas bonus for EA readers; by the time you read this, there should be a new page on the EA website, covering common problems that I get from time to time. I'll be adding to these pages as time allows, so keep checking back at <http://www.electronicsaustralia.com.au> in the Free Downloads section. I will also maintain an index of previous Computer Clinic items, which will make finding a particular tip a little bit easier. ♦

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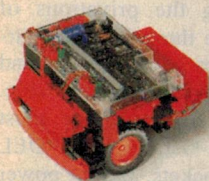
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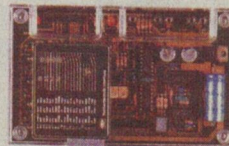


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# Vintage Radio

## Mick Fitzpatrick and his wireless

**This month's story is one that can quite literally claim to have the human touch. It begins with a chance discovery of a 1943 'Broadcast Listener's Licence' renewal form, which was stuffed inside a 1929 AWA Radiola model C54 'Battery Six' radio I had acquired for restoration. Curious, I decided to find out what I could about the original owner...**

**M**Y STORY BEGINS with the restoration of one of the many radios stored in my shed, awaiting time, money — and occasionally, enthusiasm. It had been sitting on the shelf, gathering dust for nigh-on 12 years, and I decided that its turn had come.

Pulling it down and opening it up soon revealed that someone had previously had a 'go' at it. It was partly dismantled, with a few bits and pieces in a small cardboard box. Suspicion and despair prevailed...

After removing all the components, it was discovered that the thing was actually complete, except for merely a few 1/8" diameter AWA pattern nuts and bolts, and the two audio transformers. Fortunately, the same pattern nuts and bolts were used right until the 1950's, and many a post-war AWA with a smashed cabinet has been wrecked for parts. The nuts and bolts were not a problem.

The AWA 'Ideal' audio transformers were used in factory-built AWA's in the 1928-1932 period, and were also sold commercially to other manufacturers and to the home construction market. As luck had it, two of the exact part number were found in my 'spares' box of interstage audio transformers.

So the parts weren't going to be a problem after all. But among the collection of component parts was a faded Broadcast Listener's Licence, dated 1943. It was filled out in pencil, and issued to 'M. Fitzpatrick - Campbell's Forest'. The issuing Post Office was Bendigo, Victoria. I wonder...?

Of course, there is no actual proof that the Listener's Licence and the radio belonged to one and the same person. But I think you will agree, it's a pretty safe assumption. The only real way to find out would be to see if Mr M. Fitzpatrick was/is

still alive. If he was, he would have to be aged at least in his eighties.

A check in the Bendigo telephone directory revealed that the Fitzpatrick clan is alive and well, and flourishing. Some 10



**Fig.2: The set's early owner Mick Fitzpatrick, aged in his mid-20s, by courtesy of Mr Frank Crapper of Bendigo.**

were chosen at random, and letters sent off in turn explaining my desire to contact 'Mr M. Fitzpatrick' or his descendants, to verify his original ownership of the old radio.

Yes, the replies came back, and several respondents identified the M. Fitzpatrick of

Campbell's Forest as 'Mick', who died in 1968 aged about 64 or 65 years. He was a bachelor, and from all accounts quite a character and a local identity. He did have a sister, who married a 'Mr Crapper'...

So it was back to the Bendigo telephone directory, to choose members of the Crapper family at random and send off more letters.

Again, there were more encouraging responses. A Mr Frank Crapper identified himself as Mick Fitzpatrick's nephew, and kindly provided the only photo of Mick Fitzpatrick — which would have been taken in the 1920s. I'm very grateful to Mr Crapper for his contribution. No-one recalls the radio as such, but "seemed to remember an old set of sorts; can't say if it worked or not!"

Mr Crapper also drove me out to Campbells Forest, and showed me the site of his uncle's farm. The room where he lived still stands, and is shown in the accompanying photograph.

Just why was the 1943 licence renewal form in the radio? It was common practice in those days to keep the licence with the radio itself, just in case the radio inspector called. (There was quite a stiff fine for not possessing the required listener's licence, which had to be produced upon demand.)

Perhaps during the privations of World War 2, the then obsolete four-pin battery triodes had given up and there were no replacements available. The AWA Radiola Six used the most uncommon Marconi-Osram types DEL 410 in the first five sockets, and the power type DEP 410 in the output. (It is interesting to note that those types are very hard to come by today.)

Was the set deemed unrepairable at some time during 1943/44, and then relegated to the store room, only to be discovered when his estate was disposed of? How many times





had it changed hands before I acquired it? Probably no one will ever know.

## The radio itself

THERE ARE MARKED similarities between the AWA sets of the time and the Attwater Kents. The circuit is shown in Fig.4, and a photo in Fig.5. The metalwork is compact and L-shaped, housing the four tuning capacitors and the two audio transformers in the same arrangement as the AK's. The six tubes are all lined up in a pre-drilled socket board interspaced with the coils, which was another feature of the AK's.

The circuit consists of a four-stage all triode TRF followed by two transformer coupled triode audio stages. It is about as user friendly as possible. There are only three controls; the one-dial tuning control, a filament rheostat for volume and a small variable capacitor of about 50pF connected across the first stage tuning capacitor.

Just why triode RF stages were still being used in 1929 is also a bit of a mystery. By then, the RF 'screen grid' valves were well and truly established. The predominant US type was the UX-222, and there were plenty of British types by Mullard and Cossor in particular.

You will see that there is no attempt at neutralisation. RF stability is achieved by the use of grid stopper resistors, again another feature of the AK's, and the use of the filament rheostat. This control simply cuts down the emission, and hence the gain (and with it the tendency to oscillate) of the first three stages. The handbook for the C54 states that 'the RF transformers have a very restricted field, thus minimising feedback'.

The RF trimmer is quite necessary.

This antenna loading tended to detune the first stage, and each installation would be quite different. The solution was to incorporate a small 'trimming' capacitor across the first stage which would then be used to peak the tuning for maximum strength once it was on station.

Adjusting the filament rheostat also tended to de-tune the set a little, and the trimmer needed to be used for correction.

## Reassembly

AS INDICATED earlier, the set was almost complete — even down to the factory label for the battery connections of the wiring loom. Unfortunately, the cable had been severed close to the chassis, but enough remained to join on a seven-wire cable used for wiring a car trailer. (This cable makes quite a useful battery cable for the old sets. It is cheap, already sheathed and nine times out of 10, there is a direct colour match for the battery cable of the particular radio concerned.)

The gangs and coils were assembled, and the rheostat and trimmer connected where necessary. Two audio transformers were given a touch up with a spray can of auto touch-up paint in a similar colour to the original, and duly con-



Fig.1: The original Listeners' Licence which inspired this month's story.

Depending on the type of aerial used, the loading effect could be quite different and quite apparent at different frequencies.

formers were given a touch up with a spray can of auto touch-up paint in a similar colour to the original, and duly con-

Fig. 5

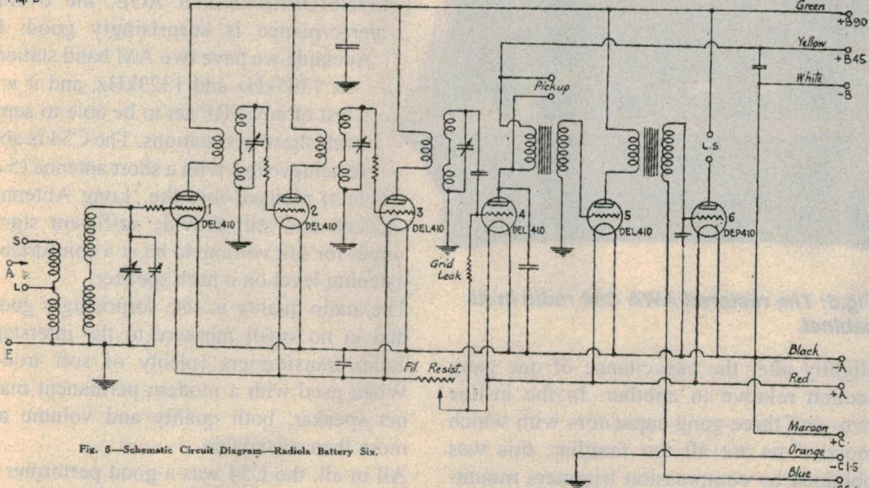


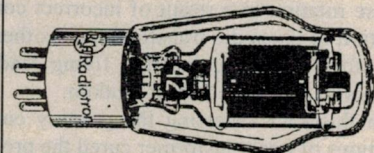
Fig. 5—Schematic Circuit Diagram—Radiola Battery Six.

Fig.4: The schematic of the C54, taken from AWA service instructions of 1929. No component values are given.

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nected. The three block-type paper capacitors measured slightly leaky, but were not replaced since adequate by-passing is provided for in the external power supply (solid state, of course!) The grid leak resistor, grid capacitor and anode capacitor of V4 were all within reasonable value, and left in circuit.

To the ininitiated, the coils may appear as a high impedance primary very loosely coupled to the tuned secondary. This is not so. The two coils of each assembly, often referred to as 'binocular coils' are the secondaries. They are wound as if on a continuous former, and at the half-way point, the former is cut in half and folded back on itself, whilst the winding itself is continuous. The primary is wound on a separate former and placed inside the earthy end of the appropriate secondary former.

This method of construction considerably reduces the stray field emanating from the coil structure. When used in conjunction with grid stopper resistors, the coupling between any two stages is sufficiently dampened to prevent oscillations.

As it happens, one item which was not repairable was the band for mechanical coupling of the tuning gangs. But fortunately, a replacement was available from Antique Electronic Supplies of Tempe, Arizona USA. Originally, the bands were riveted, but such small rivets are no longer obtainable. They were measured, drilled for the locating pegs on the capacitor drive drum, and the join was soldered. It is not original, but there are limits to any restoration project.

## Getting it going

ONCE THE WIRING had been checked and the valves inserted, it was connected to a power supply and switched on. Yes, it did work, but it was accompanied by instability.

Here again there is a trap for young players. Many enthusiasts automatically assume the howling and squealing is caused by RF instability. But in radios with two or more audio transformers, the cause is often audio feedback caused by phase rotation as a result of incorrect connection of the audio transformers. As these transformers had unlabelled flying leads, they were connected up at random.

In this case reversing the primary connections of one transformer cured the problem. (Reversing the primary in both transformers merely maintains the same relative phase relationship.)

Yes, it now worked; but there was room for improvement.



**Fig.3:** Mick Fitzpatrick's 'hut' still stands, albeit now derelict, on the site of his parents' farm near Bendigo.

## Alignment

IT'S NOT ONLY possible to align one of these sets, it is necessary! Just because there is only one trimmer as described does not mean that no alignment can take place.

The purpose of a trimmer capacitor is to

a station at the highest frequency of the band. You then loosen the grub screws on the drum assembly for the last tuning stage, and slightly rock the rotor plates back and forth for maximum strength. The remaining three sections must not be altered during this process.

Do this to each gang section except the first, which of course has its own trimmer.

Hey presto! What we have achieved is precisely the same as if a trimmer were individually fitted; we have altered the capacitance of one gang relative to its neighbour.

## Its performance

CONSIDERING ITS AGE, the overall performance is surprisingly good. In Adelaide we have two AM band stations on 1395kHz and 1323kHz, and it is a test of any TRF set to be able to separate these two stations. The C54 is able to achieve this with a short antenna (5 or 6 feet) plugged into the 'Long Antenna' socket, and still provide sufficient signal input for full volume to be at a comfortable listening level on a horn speaker.

The audio quality is also surprisingly good, due in no small measure to the interstage audio transformers (plenty of soft iron!). When used with a modern permanent magnet speaker, both quality and volume are more than acceptable.

All in all, the C54 was a good performer in its day, and not bad by contemporary standards. But the attraction of this particular set was definitely enhanced by tracing the identity of one of its early owners. ♦

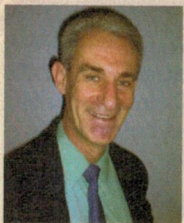


**Fig.5:** The restored AWA C54 radio in its cabinet.

slightly alter the capacitance of one gang section relative to another. In the in-line two- and three-gang capacitors with which most of us are all too familiar, this was obtained by compression trimmers mounted atop the gang — or, in the case of a dual wave radio, within the coil kit assembly.

In these old sets with separate gangs coupled by a belt drive, the technique is to tune





# Information Centre

by Peter Phillips

## Car lighting problems, project queries and more

**Our topics this month include typical lighting faults in cars (harder to find than you might think), and how to use a series capacitor to power a 12V circuit from 240V AC. We also answer reader questions, including two about our PC-driven EGO analyser. And, to all readers and contributors to this column, my very best wishes for the season.**

**E**LECTRONICS LEADS you down many paths, but one that can prove tricky is automotive electronics. I'm not talking about hi-tech electronics, but simple issues like lights that glow unexpectedly when other lights in the car are turned on. The usual reason is a poor earth, but finding it can be quite difficult.

Of course, not all problems are with lights. My first fuel-injected car developed a rather serious fault in that the engine would suddenly stop — no warning, no misfires, just plain stop. At first this happened infrequently, and if I let the engine cool down for half an hour, it could be started normally. But the problem developed to a point where the engine would only run for about 15 minutes at a time, making travel virtually impossible.

The dealer's service department tried everything, including replacing the 'black box', petrol filters and so on. There wasn't much else they could do, as the engine would start by the time a mechanic got to the car. The classic intermittent!

Finally I asked the service department to give me the circuit of the electronic fuel injection system, in the hope I might be able to find the fault. As it turned out, I *did* find the fault, a small timing coil in the distributor that had developed a temperature sensitive break. A replacement coil cost about \$5 and took around 10 minutes to fit. After replacing the coil, the car was fine; but having lost all confidence in the thing, I sold it shortly after, replacing it with a diesel powered car using mechanical fuel injection.

To me, this fault epitomised my belief that electronics in a motor car is a risky combination, given the wide range of operating temperatures, dirt, vibration and other factors. Of course things have improved, and I'm now back to a fuel-injected petrol car, after about eight trouble-free years of owning diesels.

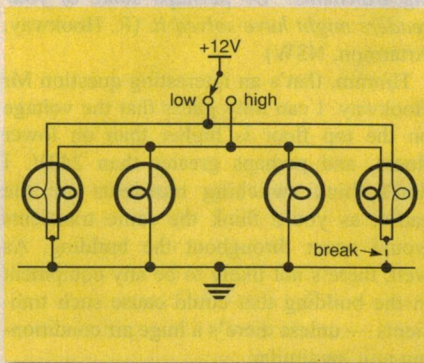
So if you've spent many hours lying under cars tracing wires to find obscure faults, you might find the following letters interesting; they're about problems with car lights. As you'll read, the fault is usually simple enough, but the symptoms can lead you on a merry dance.

### Datsun lights problem

*I've been noticing faults with car lights, something that's quite common with older Datsun 1600s and 180Bs. These cars have a headlight system in which the outer lights are low/high beam, and the inner lights are high beam. When high beam is on, all lights operate normally, but when low beam is on, the inner high beam lights glow slightly.*

The reason is an open-circuit earth, as shown in Fig.1. When high beam is on, there's enough light output from both filaments (which are now in series) to make you think the high beam lights are working normally. But when low beam is on, the return path for the filament is through the high beam filaments, which is why they glow slightly.

The letter continues, but as you can see, this fault (and the one following) illustrate how you can get a return path for one light through other lights. And of course, you

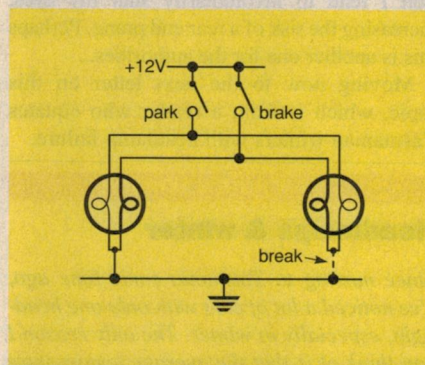


**Fig.1: A headlight earth fault in a Datsun 1600 or 180B that causes the high beam lamps to glow on low beam.**

don't need an actual break in the earth lead, simply a bad earth connection for this type of fault to occur. Here's the rest of this letter, which now deals with a rather common rear light problem:

### Brake light problem

*I was recently following a new car in which both rear parking lights appeared to be operating normally, but when the brakes were applied, the brake light on one side came on, and the parking light on the other side went out. As well the other brake light did not come on.*



**Fig.2: A earth fault that causes one parking light to go out when the brake lights come on. As well, only one brake light will operate.**

Again the reason is a faulty earth, as shown in Fig.2. When the parking lights are on, current flows through the brake lights as well, so the light intensity from both lamp assemblies is much the same, although one is actually slightly brighter than the other. For the faulty assembly, when the brakes are applied, the voltage across both filaments is zero.

Butting in again, I guess many readers have seen this fault, which is a classic with dual filament lamps. For similar reasons, it's possible to have the parking lights blinking with the turn indicator lights. In fact, there are all sorts of possibilities, but in some cases, the fault can be quite dangerous, as the last part of this letter explains.

### No brake lights

The final problem I'm writing about is quite serious, and one the authorities don't seem to have tackled. The problem concerns a situa-



tion where a car's rear parking lights are distractingly bright, with little change in light intensity when the brake lights come on.

The reason here is different to the other problems, and concerns dual filament 5/22W lamps. These have offset locating pins to make sure the lamp can only be inserted one way, ensuring each filament connects to the right circuit. But there are batches of these lamps on the market that have the filaments reversed. That is, the 22W filament connects to the parking light circuit and the 5W filament to the brake circuit. One wonders how many accidents have been caused by this problem. (Ian Johns, by fax)

Thank you Ian, for sharing these problems and their solution with us. I've often seen the last one, and it's good to know the reason. I would have looked for a faulty earth connection, and probably not have suspected the lamp. As you say, it's one that shouldn't happen, as it has considerable accident potential.

Another brake light problem is 'visual overload', in which the brake lights are so bright they dazzle the following driver. In this situation I tend to involuntarily shut my eyes, increasing the risk of a rear end prang. Perhaps this is another one for the authorities...

Moving now to the next letter on this topic, which is from a reader who equates Tasmanian winters with headlamp failure.

## This Month's Winner!

### Headlamps & winter

Since moving to Tasmania some time ago, I've noticed a lot of cars with only one headlight, especially in winter. The only reason I can think of is that the average temperature is much lower in Tasmania than in other states, especially in winter. Therefore when the headlights are turned on, the filaments go from near freezing to white heat in a fraction of a second. This temperature excursion must cause fatigue in the filament, making it fail sooner than it might in warmer climates.

However, I have an idea that might solve the problem. My suggestion is to connect a capacitor in parallel with each headlamp. This would cause the lamps to turn on more slowly, due to the capacitor charging. As a result the lamps should last longer. The problem is, what value capacitor should I use, and is my theory correct anyway? (David Crotty, North Hobart, Tas)

I agree with your explanation about why the lamps fail, David, but I don't think your suggestion to solve the problem will work. As you probably know, the time constant (T) of a series RC circuit is found with the equation  $T = R \times C$ . That is, getting a time delay with a capacitor also requires a series resistance.

In a headlamp circuit, the only series resistance is that of the connecting leads, which are

purposely made of heavy gauge cable to give a very low resistance. After all, if these leads have resistance, the headlamp current will cause a voltage drop across the cable, wasting energy and giving 'yellow' headlamps.

You may have noticed newer traffic lights turn on slowly, which is done to reduce lamp failure. However, traffic lights are powered by AC, so it's relatively easy to incorporate a triac circuit to make the lamp voltage rise slowly. This option is not easily available in a car, because the supply is DC.

A method that comes to mind is the technique used with degaussing coils in a colour TV set, which are connected in series with a positive temperature coefficient (PTC) thermistor. When power is first applied, the thermistor is cold and therefore has a low resistance, allowing full current to flow in the coils. The current causes the thermistor temperature to rise quickly, which makes its resistance increase, thereby reducing the coil current.

Connecting a negative temperature coefficient thermistor in series with a car headlight will do the opposite. That is, the thermistor's resistance drops as it warms up, meaning the lamp current rises more slowly. I wonder if this problem has been addressed anyway, particularly by European car makers, as winters in Europe are more severe than in Tasmania. Perhaps a reader might know.

Now to our next topic, which is also about lamp failure. However, the reason is more obscure, as the following letter points out.

### Failing globes

I live in a three-storey block of units which has lights on the landings of each floor, wired so they can be switched on or off from each landing. However, the light on the top floor has a failure rate that is much higher than those on other floors. This occurs with incandescent or compact fluorescent lamps.

It seems this is a common problem in multi-storey buildings, but the lamp manufacturers I've contacted have not responded. Perhaps they regard the problem as good for business! Do you think it's caused by switching transients? Or perhaps some of your readers might have solved it. (R. Hookway, Artarmon, NSW)

Hmmm, that's an interesting question Mr Hookway. I can only guess that the voltage on the top floor is higher than on lower floors, and perhaps greater than 240V. I don't think switching transients are the cause, as you'd think the same transients would occur throughout the building. As well, there's not likely to be any equipment in the building that could cause such transients — unless there's a huge air conditioning unit, or similar.

If you have a multimeter, I suggest you measure the voltage across each lamp. It may be that the wiring for the top floor is

closest to the incoming mains, with lower floors experiencing a voltage drop in the wiring between floors. This could especially apply to older buildings, as the cable size is smaller than that used today.

## 240V down to 12V

Ever wondered how to use a capacitor to produce a voltage drop in an AC circuit? It's common practice in sensor lights, yet as our next correspondent points out, there's not much written about it.

Has there ever been an article in EA that describes how to calculate the value of a series capacitor to allow a low current 12V circuit to be powered from the 240V mains, rather than use a transformer? If not, do you anticipate such an article? (R. Clape, Singleton, WA)

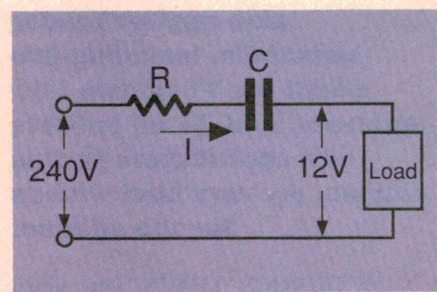


Fig.3: Basic circuit for a 12V load powered from the mains via a series capacitor. (See text for warning, though!)

As far as I know Mr Clape, this topic has not been described in EA before, so I guess now's the time. The basic circuit is shown in Fig.3, in which a suitable value capacitor and a resistor produce a voltage drop to give a load voltage of 12V AC from a 240V AC supply. It works on the premise that because a capacitor in an AC circuit is mainly reactive, rather than resistive, there's very little real power dissipated by the capacitor. That is, it doesn't get hot.

The voltage drop across the capacitor is caused by its capacitive reactance ( $X_c$ ), which is found with the equation  $X_c = 1/6.28fC$ , where 6.28 is two pi,  $f$  is 50Hz (for our application), and  $C$  the capacitance value. If you know the capacitive reactance, the value of capacitance is found by rearranging this equation to give  $C = 1/6.28fX_c$ . So to find the capacitance value, first find the value of  $X_c$  that gives the required voltage drop for the particular load current.

For instance, in Fig.3 the voltage drop is  $240 - 12$ , or 228V. If the load takes 10mA, the required value of  $X_c$  is  $228/10\text{mA}$ , or  $22.8k\Omega$ . Putting these values into the equation  $C = 1/6.28fX_c$  gives a capacitance value of around 0.14uF.

That's the theory; now for the realities. First, why the resistor? Its main purpose is for surge protection, and in my experience it



needs to be at least a 1W resistor or better. It value also depends on the load current, but is not critical. I use a value of between 5% and 10% of the capacitive reactance, so somewhere between 1k and 2k would do. At a current of 10mA, there won't be much heat dissipation; it will contribute to the voltage drop, although not as much as you might think.

In effect, the voltage drops across the capacitor and the resistor are *phasor* added, rather than simply added together. We haven't got space to go into why this is so, but in most cases you can ignore the drop across the resistor. Of course, getting a capacitor of the exact value you've calculated may well be difficult, so to get the correct load voltage usually requires some type of regulator, such as a zener diode.

Also, in most cases, the load voltage needs to be DC, so the 12V AC (or so) has to be rectified, and then regulated to 12V DC. The circuit for this would be the same as if the load was powered from a 12V transformer. Ideally, you would build the load circuit, power it from a transformer to test it and to measure the AC current it takes. Then you can do the above calculations to power it from the mains via a series capacitor/resistor.

Naturally you should use a mains rated (250V AC) polycarbonate (self healing) capacitor. And don't forget to use a one watt resistor (or higher). I found this out the hard way, and suffered the embarrassment of having the resistor fail when a client came to pick up the prototype I had developed.

**(Editor's Note: This type of power supply, connected directly to the mains without any safety isolation, is potentially very dangerous. It should only be used by those with the necessary experience, and then only for circuitry that can be doubly insulated for user protection. Beginners are strongly advised NOT to experiment with such circuits!)**

## EGO analyser

Our last letter asks for help with the PC driven EGO analyser published in Jan/Feb 1996:

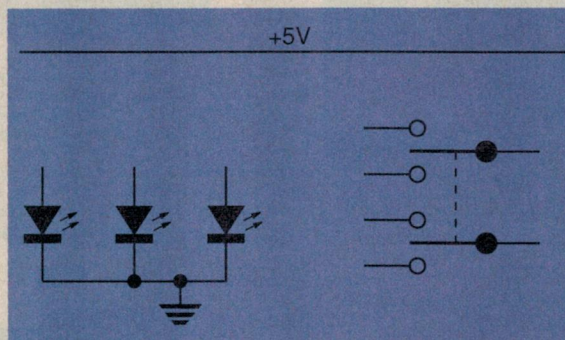
*I have built your EGO analyser, and I find in calibrate mode I can't get an output of 0V. Instead the output voltage ranges from 0.3V to 1.2V. Also, in read mode, even without a sensor, the graph is erratic. For example, it will show a high reading followed by a low*

*reading as it passes across the screen.* (Steve Paulet, Lilydale, Vic)

The 0.3V output could be due to the op-amp not being able to swing low enough — you might check the voltage of the negative supply rail. However, an output of 0.3V doesn't matter anyway, as the useful range of the output voltage is between 0.95 and 1.05V.

The analyser has an input impedance of around 1M, so you'll get noise at the output of the analyser when the sensor is disconnected. As well, it's important to make sure the input leads from the EGO sensor to the analyser are properly screened and earthed. We've not had any other similar complaints, so perhaps your wiring is the reason.

Also, you might check our website for this project's errata, in case you've missed them.



**Fig.4: Can you complete this circuit so the DPDT centre-off switch operates each LED in turn?**

## What??

It's my turn to pose the question this month. For a change, rather than solve a mathematical problem, you need to come up with a circuit:

You have a four-digit common cathode LED display, and you want to switch its decimal point over three places with a double-pole double-throw centre-off toggle switch. The basic arrangement is shown in Fig.4. So, in effect, complete Fig.4 to give one LED on for each position of the switch.

## Answer for November's What

The device is a TV picture tube. Electrons are emitted from the cathode at negligible speed, and are attracted to the screen (anode) by a high positive voltage. The electrons

therefore accelerate as they approach the screen, hitting it at about 27% of light speed. This allows us to use Newtonian physics to prove the answer, with an error of about 4%. That is, we can assume the electron mass is a constant, and acceleration is uniform from a negligible velocity.

Using the Newtonian equation

$$S = Ut + \frac{1}{2}at^2,$$

where  $S$  = distance travelled,  $U$  = initial velocity,  $t$  = time of acceleration and  $a$  = acceleration of moving electron, we can say, because  $U$  is negligible, that  $S = (1/2)(at^2)$ , or  $1/t^2 = a/(2S)$ .

As distance  $S$  is a constant and  $a$  = applied force/electron mass (from  $F = ma$ ), we can say that  $1/t^2$  is proportional to  $F/m$ . Further, assuming electron mass is a constant,  $1/t^2$  is proportional to  $F$  (electrostatic attraction), which in turn is proportional to the tube's anode voltage ( $V$ ). That is,  $1/t^2$  is proportional to  $V$ .

The number of electrons ( $N$ ) in the beam is independent of  $V$ , so the electron stream consists of  $N$  electron charges in motion. We can also say that because  $N$  is a fixed number,  $N^2$  is also a fixed (but different) number. (This is true as multiplying by any constant still leaves it proportional.) So,  $(N^2 \text{ electron charges})(1/t^2)$  is also proportional to  $V$ , or  $(N \text{ charges}/t)^2$  is proportional to  $V$ .

But  $N \text{ charges}/t$  means some number of charges passing per second, which is the definition of an electric current. So current squared is proportional to  $V$ , or electric current is proportional to the square root of  $V$ . Phew! ♦

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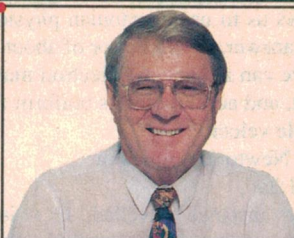
## Win this great Contrib of the Month Prize!



As an added incentive for readers to contribute to this column, we're now offering a valuable prize to the question judged most interesting, or the answer/response judged most informative, each month. The prize is a Mod-Col 38/54 high-res PAL colour video camera module from sponsor Allthings Sales & Services, with 450 lines of resolution, built-in digital signal processing, electronic shutter and auto gain control — valued at over \$400!



# ALTRONICS COMPONENTS



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Best Regards,  
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**NEW!**

No workbench should be without one!

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- Features: • LED charge & battery status indicators.
- Refresh mode.
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- Powered by 12V DC Plugpack Adaptor or via Car cigarette lighter.
- Thermal overload shutdown.
- Self test function. (See p173 of 1997/98 Catalogue for full details).
- Supplied with FREE AA adaptor plate PLUS your choice of a second FREE adaptor plate!

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- A 0255 Motorola 8000/9000/9800
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- A 0259 Nokia 2110/2120
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A 0250 Was \$79.95, **NOW ONLY \$59**

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Includes an audible continuity buzzer, 'K' type thermocouple, and square wave test signal output. Measures DC Volts to 1000V, DC Amps to 10A, AC Volts to 750V, resistance to 2MΩ and temperature from -20°C to 1370°C. It even includes a diode test function! Measuring only 70 x 126 x 25 mm and weighing only 170g, this meter is a pocket rocket with a price to match!

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Q 1054 Carry Case ONLY \$5

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**NEW!**

This miniature intelligent learning remote control can be used as a replacement for your car remote control or to combine more than one remote. ie. Garage door, car, motorbike, home alarm, etc. Features: • Four programmable buttons • Easy to program • Wide operating frequency range of 255-500MHz • Includes alkaline battery



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These mini monochrome CCD cameras are so small, they can be hidden in the most innocuous of places. The RCA video output can be connected to the video input of most modern televisions and VCRs.



Great for surveillance or security applications! Ideal for use in a video door monitor. Simple & easy to connect

Perfect for surveillance or security camera applications! Available as a complete camera with case, lens & connection leads, or as a PCB camera with lens. The S 9100 Audio PCB allows you to listen in as well via the on-board microphone! The audio board simply installs on the camera PCB, and the audio output can be connected to the audio input of most modern TVs or VCRs.

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K 6799 1200W 24V Input



All models now include **PHASE CORRECTION** to run inductive loads. ie. fridges, pumps, small motors, etc.

## Santa's Xmas Lights Kit

(See EA Dec '97) This nifty little project consists of five strings of super bright LED's that flash in a random pattern to jazz up your xmas tree!

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# Moffat's Madhouse



## Love Stories, and the Net...

**I**T'S THE CHRISTMAS season, so I've decided to drop a heartwarming story on you — at least in the first half of this column. As to the second half, you can judge for yourself.

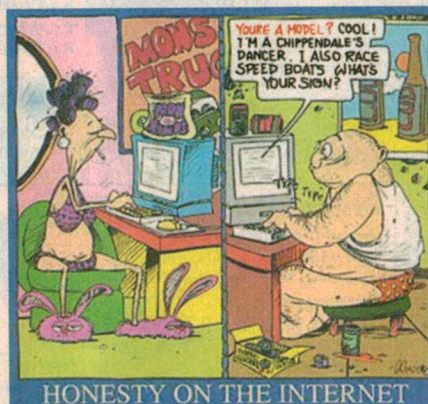
You may remember that last year, we ran a Madhouse column about finding romance on the Internet — meeting members of the opposite sex, chatting, interacting, and maybe finding the love of your life. Sometimes things aren't exactly as they appear online (see the cartoon), but in general people *are* finding people and pairing up nicely.

You may remember that as part of my research for that earlier column, I decided to meet three of these online ladies myself, face to face. A photo of my encounter accompanied that column. It's reproduced here to reintroduce three of the main players by their online names: left to right 'Buttermilk', 'Bubbaloo' and '3Blairs'. And, of course, your faithful correspondent.

Those three used to spend a lot of time chatting with each other in a chat room supplied by an Internet Service Provider in Port Angeles, Washington. There were also many teenagers on this chat line, including a boy named East99. Sometimes his mother CyberAngel joined in too.

Eventually the chatters decided they should all meet in person, at a basketball

game in which East99 was playing. A friend of East99's father, named Tarpon, also came over from Tacoma, near Seattle. It was a very friendly group, especially Buttermilk and Tarpon, who spent much of the time making goo-goo eyes at each other.



Things developed steadily, with Buttermilk and Tarpon e-mailing each other daily, and sometimes meeting on the ICQ chat service for some one-on-one private conversation. Soon Tarpon was driving to Port Angeles every time he had a day off. One thing led to another, and on May 4 this year Buttermilk and Tarpon were married, at CyberAngel's home. They now live in Gig

Harbour, not far from Tacoma, and they have a much more direct chat line.

Bubbaloo had to reach somewhat further afield to meet the love of her life — to Wales. Bubbaloo, being a lady of somewhat ample proportions, frequented a chatroom called BBW: Big Beautiful Women. But it wasn't only women; BBW also accommodated some Big Beautiful Men, including the guy from Wales with an online name of Borf. Bubbaloo and Borf spent many happy hours tossing data back and forth across the Atlantic, first through BBW and then through ICQ, where things could be much more private.

Then came a series of trans-Atlantic phone calls, resulting in a plan to meet in person. Bubbaloo found a nice cheap ticket and hopped on the plane. The moment she arrived at Heathrow, Borf stepped forward, took one look at her, and proposed. After a whirlwind week of getting to know each other, Bubbaloo returned home, armed with pictures of her beloved Borf to show to her local online friends.

Some weeks passed, not diminishing the ardour of the blushing bride-to-be. There were health and immigration matters to attend to, but eventually Borf arrived in Port Angeles. Borf and Bubbaloo were married on May 8, and are now at home in Port Angeles. They'll soon be going back to Wales, to re-do their wedding for the benefit of all the Welsh relties who couldn't make the American version.

As for 3Blairs, she hasn't quite yet tied the knot, although she's been hooked to a guy named Keith for the past year or so. Keith lives in Idaho, over 1000km away, but they keep in daily touch over the Internet between Keith's frequent visits to 3Blairs' home. An announcement is expected soon...

**Recent update:** I had a birthday this week, resulting in a nice long lunch at which Buttermilk, Bubbaloo, and Borf turned up (Tarpon was working). It was just like the old days, yackety-yack about who was doing what with whom in the chat room scene, and the usual flurry of digital pictures. One thing was obvious, though: In this fairy-tale at least, they are all living happily ever after.

### Bill & Monica show

ANOTHER NOTABLE romance owes a lot of its fame (or notoriety) to the wide avail-



**Just to remind you (L to R): Buttermilk, Bubbaloo, 3Blairs and Tom.**





**Buttermilk and Tarpon's wedding picture.**

ability of the Internet. I'm sure Australians have been following the saga of Bill Clinton and the Whitehouse volunteer Monica Lewinski, and the interesting interactions that appear to have taken place between them.

The situation first came to light in an anonymous e-mail sent to Matt Drudge (could that really be his real name?), who for the past couple of years has been running an online political news site (all right, scandal sheet). Drudge published the allegations on his web site, the mainstream media picked it up, and the story developed wings and took off big-time.

Here in the USA we have undergone many months of hearings under the guidance of special prosecutor Ken Starr, followed by statements from Bill Clinton to the effect of "I never done nothin' with that woman!". Eventually Monica Lewinski was given immunity from prosecution for possible lying and perjury, in return for her truthful and frank testimony before Ken Starr's hearings. In other words, she spilled her guts.

The testimony, including appearances by President Clinton, was held in secret, resulting in a 450-page report being tabled in the House of Representatives. Members then debated whether the report should be released to the public.

This set the scene for September 10, when rumours started flying that the release of the report was imminent. The report was said to contain — how should we put it — lots of 'juicy stuff'. A veritable presidential soap opera, in fact. A few leaks were springing, and a seasoned old journalist named Tom Moffat smelled blood. Time to join the chase.



**Bubbaloo and Borf pictured at their wedding.**

I sniffed around some of the TV stations and found nothing unusual, just a collection of sitcoms and Star Trek re-runs. So I fired up my trusty laptop and hit the Internet, first stop the ABC News web site. They were carrying a RealVideo feed from the House of Representatives, and sure enough, the debate over releasing the Starr report was in full swing.

I decided that if anyone had inside information on the report, it had to be Matt Drudge who broke the story in the first place. Tonight was going to be his crowning glory. So I tried his web site ([www.drudgereport.com](http://www.drudgereport.com)) and immediately hit a brick wall: no connection — too busy.

Thinks... A radio talkback host named Art Bell was usually right in there when interesting rumours were about, so I decided to hit his web site ([www.artbell.com](http://www.artbell.com)). He has a RealAudio feed of his program as it goes out onto the network, and just as I accessed it, Art Bell was saying he had booked Matt Drudge as an interview guest for 11:00pm, just a few minutes away. Drudge did indeed deliver the goods, revealing all kinds of juicy bits from the report which can't be repeated in a family magazine.

Click to September 11, and the debate from the House of Representatives was now on live television. The vote finally came, something like 5 to 1 in favour of releasing the report. No big surprise there. But then it was announced that, to speed things along, the report would be published in its entirety on the Internet that very afternoon.

I suspected that the whole world and at least part of Mars knew about the Starr report

by then, and with all of humanity trying to access the report at once, we might see the Internet quietly melt down. So off I went to that above-mentioned birthday lunch, expecting it would be a long, long time before I could lay my eyes on the Starr report.

The lunch was over about 3pm, and I decided to try the Internet. The main House of Representatives site, [www.house.gov](http://www.house.gov), was jam-packed. So I decided to try CNN, the renowned Cable News Network. Sure enough, they had a link to the Starr report, and when I clicked it, the words jumped onto the screen. It didn't take long to find the juicy bits, written by Starr in the style of a novel rather than a government report. Clinton did that? Wow! And then Monica did... well, you get the idea.

That night on TV news we saw images of most of America sitting in front of their computers, eyes wide. There were reports from government offices of staff reading the lurid stuff out loud to each other — the alleged actions of their boss, the President.

As this is written, members of the House, and the Clinton camp, are spending the weekend considering their options. And I've been wondering — why didn't the Internet melt down as expected? Why was it so easy for me, and the rest of the world, to access that report?

I think the answer is that the report was 100% text; no graphics or pictures. Maybe if graphics weren't used so often on other web sites, we could easily access the information we want, all the time. As it was, the Internet made it dead easy for me to do a lot of journalistic snooping in a very short time. May the 'Net ever live in abundant health, and shed its graphics if things get too sticky... ♦



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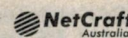
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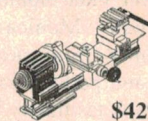
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## An Excellent Introduction!

# Basic Electronics

by Peter Phillips

At last, there's a new and easy to read introduction to modern electronics, for students and hobbyists. The author is well-known technical writer Peter Phillips, a former technical college teacher who has produced many award-winning electronics textbooks and is also a regular contributor to *Electronics Australia* magazine.

Peter's new book is written in an easy-to-read style, and includes not just theory but also a selection of simple construction projects, to give valuable 'hands on' learning.

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# New Books

## Basic Stamp revealed

**PROGRAMMING AND CUSTOMISING THE BASIC STAMP COMPUTER**, by Scott Edwards. Published by McGraw-Hill, 1998. Hard covers, 240 x 192mm, 285 pages, with CD-ROM. ISBN 0-07-913683-4. RRP \$73.95.

Parallax Inc's easy-to-program BASIC Stamp microcontrollers have become very popular overseas, and now seem likely to do so here too, since they've become available through Dick Smith Electronics. Which makes this new book and CD-ROM combination from well-known US 'BASIC Stamp guru' Scott Edwards very appropriate...

Mr Edwards was the founding writer of a very popular 'Stamp Applications' column in US magazine *Nuts & Volts*, and is also author of *The PIC Sourcebook* — so he's both an experienced technical writer and also very knowledgeable about PIC micros and their dedicated BASIC-speaking offshoots.

In this book he provides not only a very readable introduction to the BASIC Stamps and how they're used, but also a friendly and down-to-earth introduction to basic electronics. He covers not just what the Stamps are, how they work and how they're programmed, but also gives full details of some 12 easy to build hands-on projects. These include a 'magic message' display, an intelligent traffic light simulator, a data-logging thermometer, a robotic 'bug' with whisker sensors, a flexible serial terminal and a short-range sonar.

The accompanying CD-ROM also provides lots of really useful 'bonus extras', including the full 450-page Parallax manual for BASIC Stamp 1 and 2 (in PDF format, but with Acrobat Reader thoughtfully included); some 29 of Mr Edwards' own Stamp Applications columns from *Nuts & Volts*, also in PDF format; the Parallax PC host software for programming both Stamps 1 and 2; the PBASIC programs for the projects given in the book, as well as those in Parallax's application notes; and even a catalog for his own Stamp-related project kits.

In short, the book and CD-ROM together provide just about everything you'd need to get going with BASIC Stamps, apart from a Stamp module and the cable to hook it up to your PC for programming. Highly recommended! The review copy came from McGraw-Hill Books, of PO Box 239, Roseville 2069. However I understand Dick Smith Electronics is now also stocking this book, in soft cover form (Cat. No. B-4807, \$77.95). (J.R.)

## Security systems DIY guide

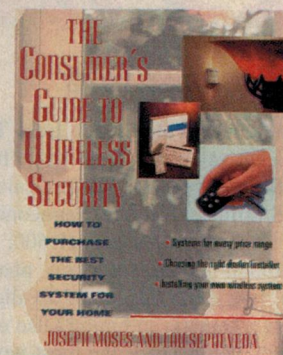
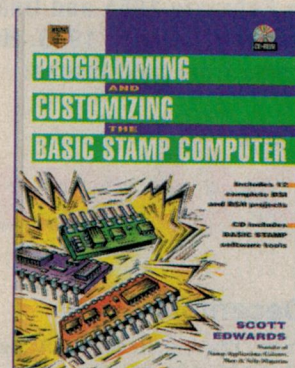
**THE CONSUMER'S GUIDE TO WIRELESS SECURITY**, by Joseph Moses and Lou Sepulveda. Published by McGraw-Hill, 1997. Soft cover, 186 x 234mm, 209 pages. ISBN 0-07-043493-X. RRP \$39.95.

This book has an air of authority not always found in books about security systems. It's also up-to-date, practical and sticks to its topic, presenting information that even an experienced security system installer will find interesting. It starts by outlining why you should install a wireless security system, giving practical advice on how to evaluate your 'SQ', or security quotient. This chapter also discusses issues such as phone conversations with an unknown caller, the best type of message to put on your answering machine and other useful hints to increase your security.

The book then looks at the history of wireless security systems, including a rundown on what's currently available. It also covers costs, although being a US book the prices are only a guide for the Australian market. But the main content of the book is about wireless security systems, and virtually every component and option is described in enough detail to allow the reader to make informed decisions on what to include in a system. Topics include purchasing a system, installing it (or having it installed), whether to use a wired or wireless system, even how to choose a security system dealer. Smoke and fire detection is also discussed, and there's even a chapter on preventing false alarms.

The content is not highly technical, with technical terms described as required. However it covers the field in an authoritative way, with a friendly writing style, a good range of photos, checklists and a comprehensive glossary.

The review copy came from McGraw-Hill, PO Box 239, Roseville 2069. (P.P.) ♦





*Electronics Australia* is one of the longest-running technical magazines in the world. We started as *Wireless Weekly* in August 1922 and became *Radio and Hobbies in Australia* in April 1939. The title was changed to *Radio, Television and Hobbies* in February 1955 and finally, to *Electronics Australia* in April 1965. Here are some interesting items from past issues:

## 50 years ago

### December 1948

**Long Playing Records:** A significant advance in commercial phonograph records was made in June, when Columbia announced its 'Microgroove' records. Up to 50 minutes of music may be recorded on a single 12-inch Microgroove record, compared with only eight or nine minutes on a standard 12" disc.

The new records differ from conventional ones in two major respects. First, they are recorded at 33-1/3rpm (standard broadcast subscription speed), instead of 78rpm. Second, the number of grooves per inch is from 224 to 300, compared with about 90 in conventional records. This means that the groove width is approximately one-third that of ordinary phonograph records.

Because of the reduced groove width and stylus diameter, the frequency response and lack of distortion are superior to previous 33-1/3rpm recordings at their critical inner diameter, according to Dr Peter Goldmark, director of engineering R&D at CBS and in charge of development of the new records.

The discs are made from low noise Vinylite plastic. The recording curve used is similar to the standard NAB characteristic, except at frequencies below 100 cycles.

## 25 years ago

### December 1973

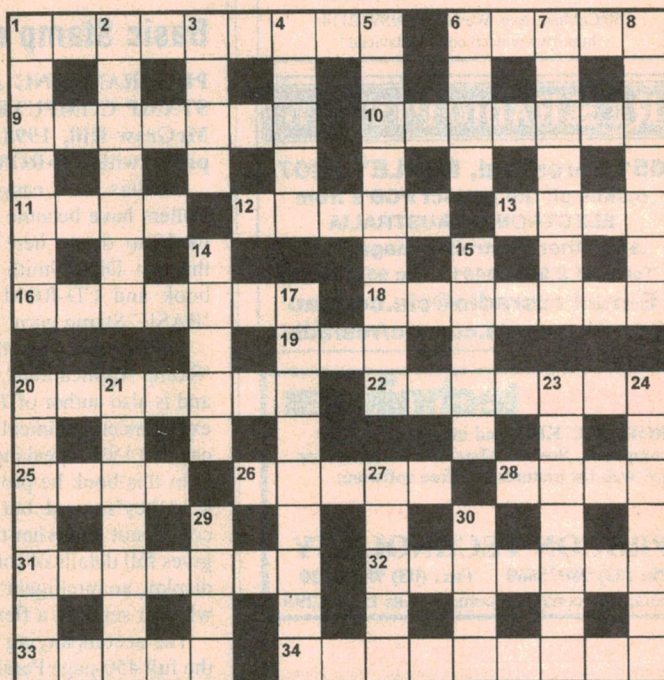
**Pocket Calculator for Less Than \$30:** The latest shot in the pocket calculator price battle has been fired by NS Electronics, who have released the first calculator produced by their dynamic US affiliate, National Semiconductor.

Called the NS Model 600, the new unit is being marketed through department stores, pharmacy chains and discount houses. It offers a display of six digits, automatic integral exponents and automatic summing (also called 'counting' on other calculators). But perhaps the most newsworthy feature is the cost: recommended retail is only \$29.95.

Apparently this is even lower than the US retail price, thanks to bulk buying by NS Electronics and a favourable rate of exchange.

**101.5 Percent Conductive:** Australian copper has an electrical conductivity which is higher than 100%. Whilst theoretically this does not seem possible, the explanation of this apparent contradiction lies in the remarkable efforts made by the Australian copper industry to upgrade the purity of its products. Today, Australian copper exceeds the IACS international standards of conductivity, by about 1.5%. Research indicates that the practically attainable limit for copper is close to 102.25%. ♦

# Crossword

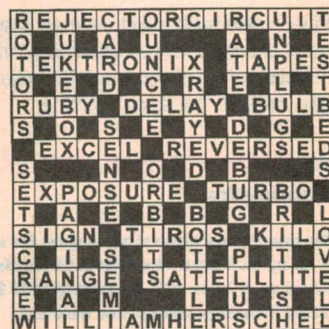


### Across

- 1 Persistence of a screen. (9)
- 6 Numerical data element. (5)
- 9 Noise of natural electrical discharge. (7)
- 10 Said of some EM waves. (7)
- 11 Name of an effect in AC. (4)
- 12 Determine mass. (5)
- 13 Individual musical performance. (4)
- 16 Pertaining to number. (7)
- 18 Changes into charged particles. (7)
- 19 Manufacturer of the K6 microprocessor. (1,1,1)
- 20 Element in compound semiconductor. (7)
- 22 Property of lowest melting point. (7)
- 25 Relationship of your ABC to you? (4)
- 26 Recurring paths. (5)
- 28 Short item on video. (4)
- 31 Country of Fitzgerald, associated with Lorentz. (7)
- 32 Electrode of a transistor. (7)
- 33 Components used in CRT displays. (5)
- 34 Often measured in dB. (9)

- 4 Word in VLSI. (5)
- 5 Hollow metal conductor. (9)
- 6 Type of antenna. (4)
- 7 Said of near-full moon. (7)
- 8 Vibrations. (7)
- 14 Trace of meteor image on exposed film. (5)
- 15 Section of the number system. (5)
- 17 Compact video camera with a VCR. (9)
- 20 Attractive force. (7)
- 21 Name of a fixed resistance potentiometer. (7)
- 23 CRT's electrodes for horizontal deflecting. (1-6)
- 24 Base SI units. (7)
- 27 Way to operate a button. (5)
- 29 Fundamental physical quantity. (4)
- 30 Queue list (acronym). (4) ♦

### November's solution:



### Down

- 1 One skilled in an art. (7)
- 2 Element 69, used in radiography. (7)
- 3 Light sensors in retina. (4)

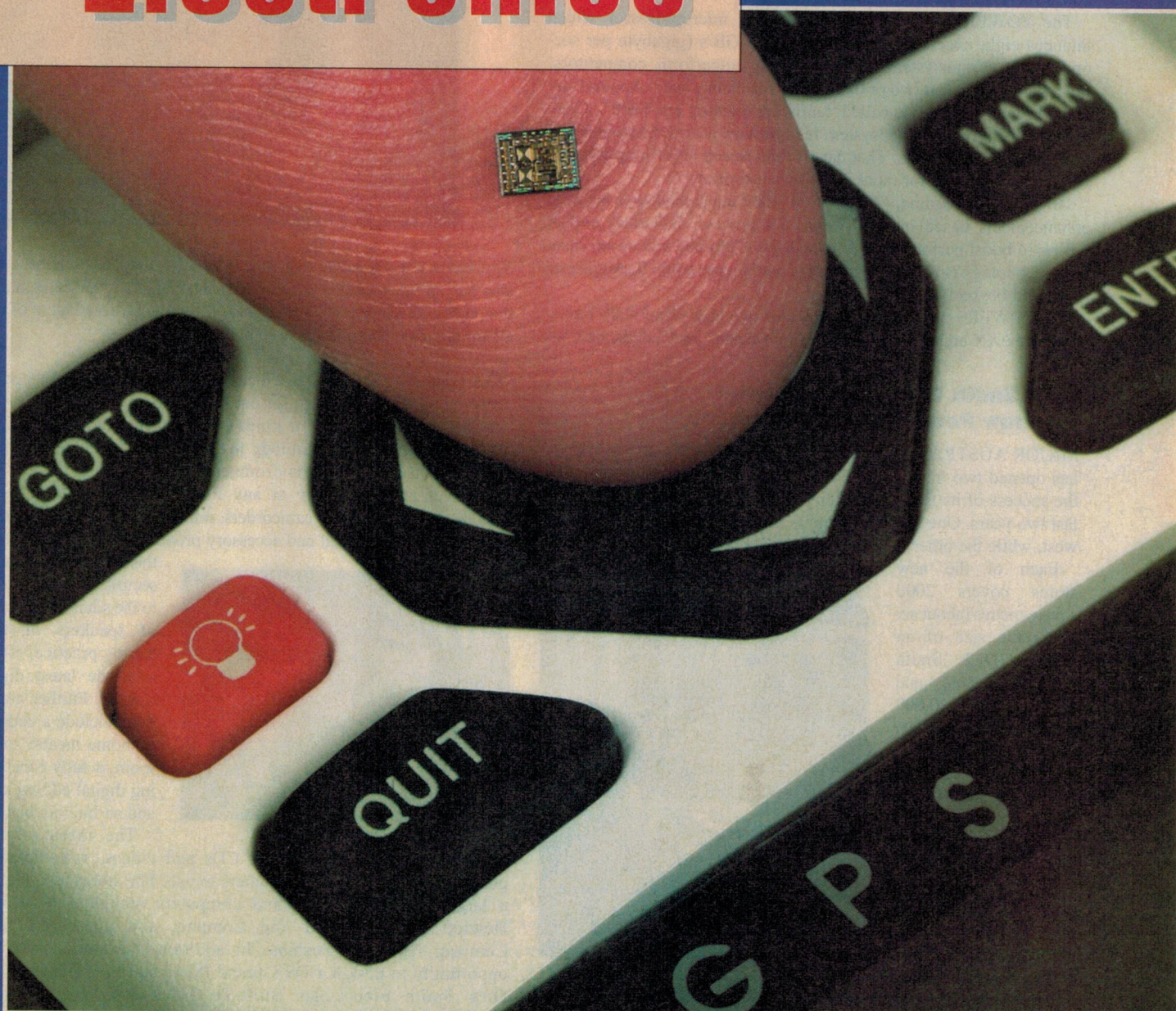


# Electronics Australia's **Professional Electronics**

**Dick Smith Electronics** opens  
two more 'Powerhouse'  
concept stores, more coming

How the new Iridium satellite  
phones were developed

Review: **InterLink-2000's**  
flexible realworld PC  
interfacing system & modules



IBM's new **silicon-germanium** chips: now going into GPS sets,  
cellphones and other handheld 'information appliances'...



# News highlights

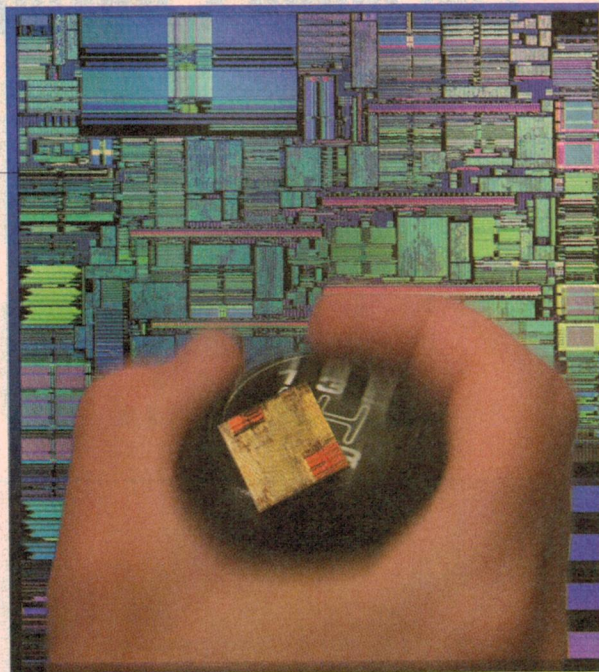
## New IBM RISC chip has 15M transistors

IBM HAS introduced a new microprocessor, the POWER3, which contains 15 million transistors — twice as many as a typical desktop PC. The new chip performs like eight micros in one, and is planned to power the next generation of IBM's RS/6000 high-end graphical workstations. It has made its debut in the new RS/6000 43P Model 260 workstation, just released by IBM.

The POWER3 is a 64-bit RISC based microprocessor which includes eight execution units, fed by a 6.4GB/s (gigabyte per second) memory subsystem, allowing it to outperform competitors' processors running at two or three times the clock speed. Another key innovation is a technique called 'hardware memory pre-fetch', where the intelligent memory subsystem recognises a user's commands and retrieves often-used data. That data is then stored in the chip's cache, where it is available for quick recall when needed.

IBM says its 'roadmap' for the POWER3 microprocessor includes enhancements based on the CMOS 7S process, including copper wiring to boost performance (planned for 1999) and silicon-on-insulator technology (in 2000), driving the performance into the gigahertz range and beyond by 2001.

The POWER3 processor core includes two high-bandwidth buses: a 16-byte 6XX architecture bus to main memory, and a dedicated 32-



byte bus to the L2 cache that runs at processor speed. The processor also has an advanced on-chip 64KB data cache and a 32KB instruction cache. It features 0.25um hybrid lithography, five layers of metallisation, and 1088-pin ceramic packaging.

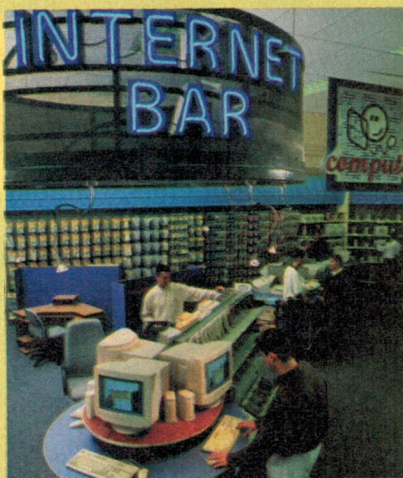
## Dick Smith Electronics opens two new PowerHouse stores

MAJOR AUSTRALIAN electronics retailer Dick Smith Electronics has opened two more of its PowerHouse concept stores, following the success of its first PowerHouse in Bankstown, Sydney over the last two years. One of the new stores is in Penrith, in Sydney's outer west, while the other is in Carnegie in Melbourne.

Each of the new stores covers 2000 square metres (about six times the size of an average Dick Smith Electronics store) and features over 20,000 products in its range. The Penrith store is located on the corner of Batt Street and Mulgoa Road, while the Carnegie store is at 1054 Dandenong Road.

"Our Victorian customers have been waiting two years for a PowerHouse, and finally they are able to experience everything that our concept stores have to offer," said Jeff Grover, Managing Director of Dick Smith Electronics.

"The PowerHouse concept focuses on the convergence of consumer technology in the Australian community", Mr Grover added.



"Everything at a Dick Smith Electronics PowerHouse is plugged in, powered up and fully tuned for our customers to try out."

"The aim is to bring all kinds of electronic, communications and computer-based technology to Australians in a fun, informative and non threatening environment."

Connectivity is the key at any PowerHouse store. The range includes big screen TVs, camcorders, music, video, computers and a huge range of peripheral and accessory products. Visitors can set off

the alarm on a home security product, listen to the sound from a pair of speakers or take some practice shots with the latest digital camera. Further attractions include a dedicated home theatre sound room, a fully functioning digital editing suite and an Internet bar.



The music section includes a very large range of CDs and videos, with listening posts around the area for customers to use. The stores also feature a large range of major-brand computers including PCs from Hewlett Packard, IBM and Compaq, and notebooks from Compaq, IBM and Toshiba. In addition, customers have the opportunity to design a DSX-brand PC to suit their needs on the Dick Smith Electronics Built-To-Order computer program. Customers can select the specifications of a computer on the user-friendly in-store terminal and have a new PC built and delivered to their door in eight working days.



## Sydney's tertiary colleges to have 'Super Corridor'

UNIVERSITIES AND TAFE colleges in Sydney are to be linked by a high-speed 'information super corridor', similar to the 'Internet 2' system proposed for the USA by Vice President Al Gore. The new network is expected to achieve data transfer rates of at least 1GB/s (gigabyte/second), using photonics technology.

EnergyAustralia plans to build the photonics super corridor, consisting of slender optical fibre cables hung on existing power poles. The corridor is expected to connect to a supercomputer facility at the Australian Technology Park in Eveleigh.

The demonstration project is expected to showcase leading-edge Australian technology and significantly boost R&D links between Australian students and academics.

## Protel acquires MicroCode Engineering

SYDNEY BASED Protel International, a leading developer of Windows-based electronic design software, has strengthened its position in circuit analysis through the acquisition of MicroCode Engineering Inc., of Orem, Utah.

MicroCode has over 10 years experience in the development of circuit simulation software, and is a strong player in providing affordable, easy-to-use simulation tools in North America. Its CircuitMaker software uses enhanced versions of SPICE3f5 and XSPICE to perform analog and mixed-mode simulation, and in contrast to many SPICE simulation programs available today, features an intuitive graphical interface that makes simulation very fast and straight forward. It has also been successful in marketing Windows-based PCB layout and circuit design software based on Protel's original DOS-based products.

The acquisition is seen as a positive development for both companies, who share similar philosophies regarding the need for affordable and easy-to-use design tools.

"MicroCode has developed powerful circuit analysis tools and made them easy to use", says Nick Martin, Protel's founder and CEO. "This is very much in harmony with the approach that Protel has taken with various technologies over the years."

Ozzie Boeshans, president of MicroCode Engineering, agrees. "Protel is rapidly emerging as a major player in the EDA market, and its philosophy of making design easy is very close to our own. We felt that we could very easily align ourselves with what Protel is doing."

## Siemens claims fastest transmissions

A TRANSMISSION system with a capacity of 4 x 40Gb/s (gigabits/second) has been prototyped and demonstrated by Siemens at its development centre in Munich, Germany. With the aid of wavelength division multiplexing (WDM) it succeeded in transmitting four 40Gb/s channels successfully on a single glass fibre. The signals were transmitted absolutely error free (zero bit error rate) and without amplifiers, over a 60km link.

Siemens claims to be the first company worldwide to implement 40Gb/s transmission using time division multiplexing (TDM), using purely electronic switching at both transmitting and receiving

ends. It says that electronic TDM is significantly more cost-effective than conventional optical TDM, as it requires less outlay on expensive equipment. In addition, the pulse structure of the electronically multiplexed 40Gb/s signal lends itself better to WDM technology, as there is no limitation on the number of possible WDM channels.

The transmission systems in commercial use nowadays are generally 2.5Gb/s or 10Gb/s systems, and WDM technology can currently span distances of up to 600km purely using optical amplifiers.

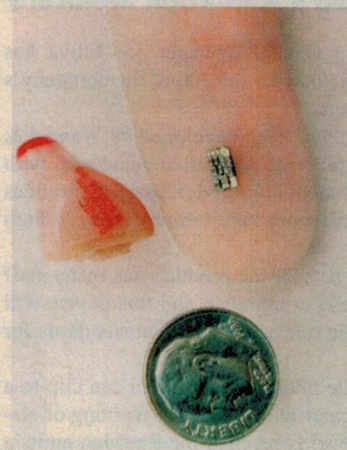
## Smallest, most 'natural' hearing aid

SONIC INNOVATIONS, a firm based in Salt Lake City, Utah, has unveiled what it claims is the smallest, most powerful microchip ever used in a hearing aid. The chip is used in the firm's new Natura digital aid, enabling it to more closely mimic natural hearing by doubling the ability to personalise the aid's performance to meet individual needs.

Containing patented and proprietary DSP technology, the new Natura aid is claimed to allow hearing-impaired users to regain a more complete hearing experience by allowing more accurate programming of its parameters. The sound spectrum is split into twice as many sub-channels (each a half-octave in span) as any other aid currently available. It's also claimed to process signals at a rate 50 - 90% faster than traditional hearing aids.

Each Natura aid is individually configured by a hearing professional to the unique needs of its hearing-impaired user, using a 3Com

PalmPilot handheld computer. The technology is claimed to offer the first major advance in hearing technology for nearly a decade. It is based on algorithms and technology developed by Dr Douglas Chabries, Dean of the College of Engineering and Technology at Brigham Young University; Dr Thomas Stockham, widely regarded as the 'father' of digital recording; and Dr Carver Mead, professor of computer science at the California Institute of Technology.



(More information is available at the SONIC innovations website, <http://www.sonici.com>)

## Satellite-based mobile comms system for DoD

COMPUTER SCIENCES Corporation has teamed with NEC Australia and Optus to develop a new satellite-based mobile communications system capable of carrying classified messages for the Department of Defence. The Defence Mobile Communications Network (DMCN) will enable personnel in the Army, Royal Australian Navy and the Royal Australian Air Force to communicate operational and adminis-

### IN BRIEF

- The Australian Society of Motion Picture and Television Engineers with stage **SMPTE '99** at the Sydney Convention and Exhibition Centre, Darling Harbour from July 13-16, 1999. Alongside the exhibition will be a pertinent and innovative conference program focusing on industry trends and growth.

- America's Consumer Electronics Manufacturers' Association (CEMA), a sector of the Electronic Industries Association (EIA) will be holding the **1999 International CES — The Source for Consumer Technologies** in Las Vegas, Nevada, on January 7 - 10, 1999. As well as the show itself, an extensive program of CES Conference

Sessions will cover the latest trends in the computing/convergence marketplace.

- Paul Erickson has been appointed as managing director of Brisbane-based **Siemens Hearing Instruments**, with a focus of improving the quality of hearing for hearing-aid users. ♦



trative information throughout Australia and out to sea.

As well as providing secure digital voice, data and fax communications by satellite, the DMCN will connect into the Department of Defence's terrestrial networks.

Twenty CSC systems, software and hardware engineers will carry out the DMCN development and support, worth approximately \$10 million, in the company's offices in Adelaide.

The new DMCN, like the interim version delivered in 1996, is based on the MobileSat telecommunications system developed over the last eight years by CSC, NEC Australia and Optus Communications. The world's first commercial mobile satellite communications system, MobileSat was launched in August 1994.

Under a contract with NEC Australia, CSC will enhance existing software by incorporating encryption techniques and upgrade transmission security by enabling the system to automatically change identification information attached to messages.

The Department of Defence will use encryption devices attached to the handsets and within the Defence Secure Network and the Defence National Telephone Environment to enable the transmission of highly sensitive material. Delivery of the DMCN will be completed by late 2000.

## Telstra buys 200 of W&G's Radiation Monitors

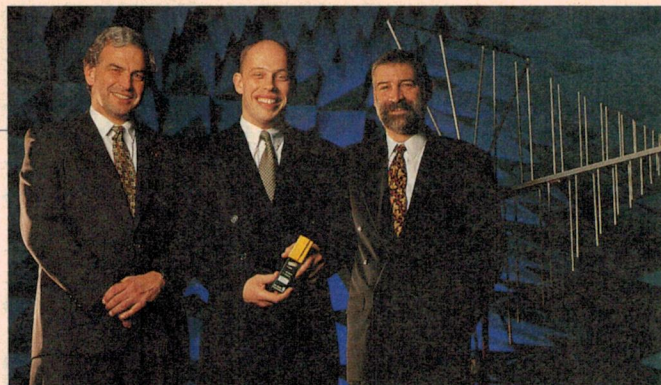
WANDEL & GOLTERMANN's general manager Joe Oliva has announced that Telstra has placed an order for 200 of the company's new RadMan RF radiation monitors.

"The RadMan", said Mr Oliva, "has been developed by Wandel & Goltermann to comply with the relevant Australian standards, with assistance from Telstra Research Scientist Ray McKenzie. It provides immediate benefit to anyone whose work involves proximity to high level RF electromagnetic fields."

"Telstra, which will be a large user of the product, has many staff who work near live RF transmitting equipment, and this device will help ensure they remain within the relevant Australian standards for allowable exposure to RF."

About the size of a small mobile phone, the RadMan can clip to a belt or harness. It provides the wearer with an instant warning of elevated RF fields. When a preset level is reached the RadMan emits a continuous beeping tone.

"The RadMan is simple to operate and doesn't require any interpretation. Its readings let you know on the spot whether the area is either go or no-go", added Mr Oliva. "It measures a broad range of



electric and magnetic fields and is triggered according to the relevant Australian standard."

The RadMan operates on standard batteries, which provide for a battery life of up to 300 hours. A distinguishing feature is that the RadMan provides simultaneous E and H field measurement, which is important for many of the situations users will encounter.

## New Acer HQ near Olympics site

ACER COMPUTER Australia is investing \$10 million over the coming two years to develop new headquarters at the Olympics site at Homebush Bay.

"Our investment in a new Homebush Bay headquarters demonstrates our absolute long-term commitment to the Australian market and provides the space we need to accommodate the company's strong growth", said Mr Patrick Lin, MD of Acer Computer Australia. "It makes sound economic sense to move from leasing facilities to investing in our own premises. This will allow us to centralise our corporate support, production, administrative, sales and marketing services, as well as warehousing facilities."

The new headquarters is only 400 metres from the Olympic Stadium and 250 metres from the Olympic Park railway station. It will be home to the Acer Corporate Action Centre, the Acer Integration Centre, the Acer Repair Centre and the Uniload build-to-order facility, which will have an initial capacity to produce up to 12,000 PCs a month. To date, Acer has manufactured a total of 163,363 PCs in Australia, and is expected to hit a milestone of 200,000 units by May 1999.

There will be approximately 180 staff on site. Among these will be 10 product support engineers for the Corporate Action Centre and nine technical and support staff for the Integration Centre, as well as 58 production personnel. Acer personnel are scheduled to move into the 4567m<sup>2</sup> premises early in 1999. The company's 12,890m<sup>2</sup> site on Figtree Drive allows capacity for future expansion. ♦

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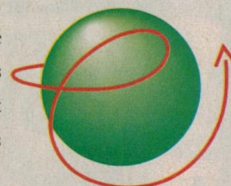
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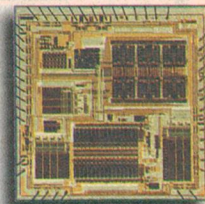
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<sup>1</sup>50 hours free must be used within one month of registration; <sup>2</sup>based on pre-paid OzSaver Plan 10 hours a month for \$19.95, customers must sign up for 12 months, charging will revert to casual access rates when 10 hours is used each month; <sup>3</sup>i) offer available to dial-up modem customers only; ii) telephone charges are separate; iii) one off registration fee of \$25 applies to all new customers; iv) to register, a valid credit card is required.

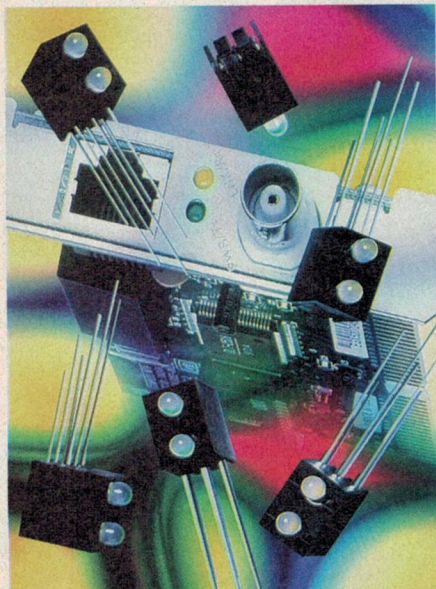


# Solid State *Update*



Keeping you informed on the latest developments in semiconductor technology

## Bi-level, tricolour LED assemblies

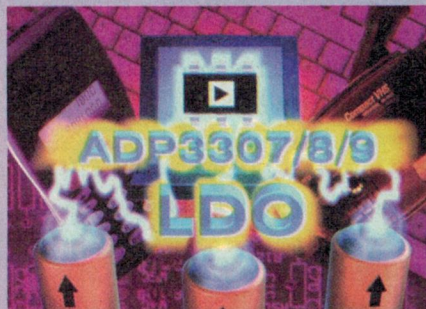


Bivar's new range H280CBC Series is a T-1 (3mm) bilevel, tri-colour, tri-lead LED assembly that is claimed ideal for network, router and telecommunications applications. It is the first in a series of products from Bivar to offer multicolour LED assemblies in a standard footprint.

The H280CBC bi-level LED assembly

## LDOs work with virtually any capacitor

The new ADP3307, ADP3308 and ADP3309 'anyCAP' LDOs (low dropout regulators) from Analog Devices deliver high accuracy, low dropout and stability with any type of 0.47uF output capacitor



comes in a single station housing made from black nylon, per ASTM D-4066 PA111m UL rated 94V-0. Housing standoffs facilitate board washing and removal of fluxes and residue.

Initially white, each LED offers a choice of three colour combinations; red/green/amber, yellow/green/amber, and red/yellow/amber. Colour selection is derived by switching the polarity of the signal. In addition, each LED offers the choice of three circuit options: common anode, common cathode, and mixed circuitry. Staggered lead lengths offer easy coding and simplify installation.

For more information circle 272 on the reader service card or contact M. Ruddy & Co., 4 Beaumont Road, Mt Kuring-Gai 2080.

## Accurate oscillators need no reference

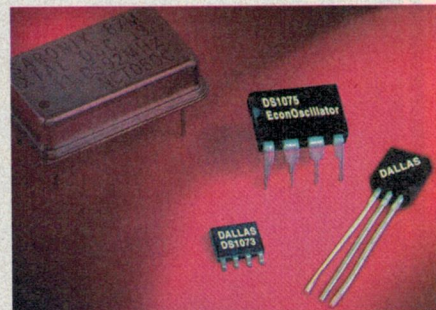
Dallas Semiconductor's new additions to its family of EconOscillators offer space-saving, practical replacements for bulky resonators and oscillators. Each of the reprogrammable single-chip devices provides system reference frequencies using less board space than alternative devices. The new devices extend the family by adding 3V operation, industrial temperature range operation, and TO-92 packaging.

EconOscillators provide onboard programmable clock reference frequency. Multiple output frequencies in the 30kHz to

regardless of its ESR (equivalent series resistance) value — including ceramic types (MLCC). This reduces the overall system size, and is claimed to make the LDOs ideal for space restricted applications.

The new anyCAP technology developed and patented by Analog Devices uses a single loop for regulation and reference functions, controlled by a very high gain error amplifier. A special non-inverting driver between the error amplifier and the pass transistor is designed specifically to enable the frequency compensation to include the load capacitor in a pole-splitting arrangement. This reduces sensitivity to the value, type and ESR of the load capacitance.

For more information circle 271 on the reader service card or contact Analog Devices, Suite 4/1621 Point Nepean Road, West Rosebud 3940.



100MHz range are possible through the use of a master oscillator followed by a user-programmable, on-chip prescaler and divider.

There are three new versions:

- The DS1075-IND, a version of the original DS1075 EconOscillator characterized for operation over the -40° to +85° C industrial temperature range;
- The DS1073, a 3V version of the DS1075 suitable for small, battery-powered, handheld applications and other systems that require low-voltage operation; and
- The DS1065, providing the programmable feature of the DS1075 in a space-saving, three-lead TO-92 package.

Typical applications include set-top boxes, tabletop games, disk drives, digital cameras, PCMCIA cards, laptop computers, access control systems, video cards and motherboards. If greater timing accuracy is required, an 8-pin EconOscillator can be used with an external clock or a crystal reference. This flexibility provides an alternative to crystal-in-a-can oscillators and more expensive PLL-based frequency synthesis approaches.

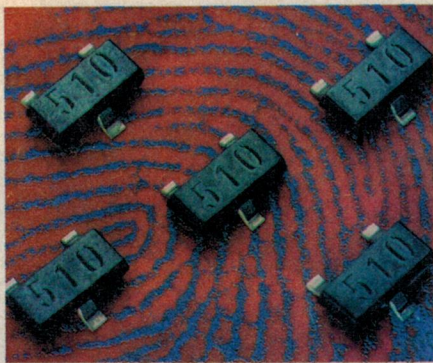
For more information contact Dallas Semiconductor at 4401 S. Beltwood Parkway, Dallas, TX 75244-3292.

## Low capacitance Schottky diodes

Specified with a typical capacitance of just 0.9pF, a new RF Schottky barrier diode from Zetex is claimed to offer users zero bias operation in applications including RF signal detection and mixer applications in the GHz region.

Thanks to careful selection of barrier metal and manufacturing process technology, the SOT23 packaged ZSS1510 provides host circuits with both high sensitivity and low video impedance. As an indication, at a frequency





of 2.4GHz, power input of -20dBm and load resistance of 100k $\Omega$ , the diode displays a voltage sensitivity of 1.3mV/uW. For the same conditions, the video source impedance of the diode is just 500k $\Omega$ .

Absolute maximum power dissipation rating at an ambient temperature of 25°C is 330mW. Under forward current conditions of 10mA, dynamic resistance of the device is a maximum at 17 $\Omega$ .

For more information circle 273 on the reader service card or contact GEC Electronics Division, Unit 1, 38 South Street, Rydalmere 2116.

### Line driver for ADSL G.Lite systems

The new low cost DRV1101 from Burr-Brown is claimed as the industry's first low power, single 5V supply line driver designed for ADSL (Asymmetrical Digital Subscriber Line) G.Lite systems. In an ADSL Lite system, the DRV1101 is used to transmit information from the customer (upstream) to the central office.

The DRV1101 dissipates much lower power and is available in a much smaller package than other ADSL line drivers. Operating on a single 5V supply, it can supply up to 230mA peak output current with an output voltage swing of 7Vp-p. In ADSL G.Lite applications, it supplies 10dBm average line power with a crest factor of 5.3 for a peak line power delivered of approximately 25dBm.

ADSL technology provides bidirectional high-speed digital information transfer over standard copper telephone lines. ADSL modems can transfer data more than 25 times faster than today's fastest analog modems (V.90, 56k). ADSL G.Lite is a special lower



### High performance BiCMOS audio DAC

Burr-Brown's new PCM1704 is claimed as the world's highest performance BiCMOS, sign-magnitude audio digital-to-analog converter (DAC), and is designed for high-end consumer and professional audio applications such as high-end DVD players, high-end CD players, digital effects processors, digital mixing consoles and broadcast systems.

At 24-bit resolution and 8x oversampling at 96kHz, the PCM 1704 delivers 112dB Dynamic Range, 120dB Signal-to-Noise Ratio (SNR), and very low distortion (K Grade: THD+N = 0.0008%).

The PCM 1704 is fabricated in a BiCMOS process and designed using precision laser trimming techniques to achieve outstanding signal accuracy, excellent full-scale performance, superior



low-level linearity, and improved signal quality. Key features and specifications include: 16kHz-96kHz sampling frequency (fs), 20/24-bit input audio data word, fast current output (+/-1.2mA/200ns), glitch-free output, pin-programmable data inversion and +5V power supply.

For more information circle 276 on the reader service card or contact Kenelec, 2 Apollo Court, Blackburn 3130.

cost version of ADSL that is expected to be widely used by manufacturers of PC plug-in cards, networking products, modems, and other customer premises equipment (CPE), especially for Internet access.

DRV1101 key features and specifications include high output current (230mA), single 5V supply operation, 17MHz bandwidth (6Vp-p into 15 $\Omega$ ) and very low THD (Total Harmonic Distortion) at high power (-71dBc at 6Vp-p, 100kHz, into 15 $\Omega$ ). The DRV1101 is packaged in an 8-lead SOIC.

For more information circle 274 on the reader service card or contact Kenelec, 2 Apollo Court, Blackburn 3130.

### Low power 12-bit, 53MHz ADC features high SNR

Burr-Brown's new low cost ADS807 is a 12-bit, 53MHz analog-to-digital converter offering high signal-to-noise ratio (68dB) and low power dissipation (335mW), making it suited for medical imaging (ultrasound, gamma cameras), communications and video applications.

The ADS807's high dynamic range performance gives increased sensitivity over 10-bit solutions, while low power makes this performance very suitable for high-channel count (128 to 1024) beamforming systems. The ADS807 offers greater design margin over previous solutions when using lower sampling rates.

The ADS807 provides an internal bandgap reference circuitry, thereby minimizing external circuitry. In addition, there is an option to disable the internal reference, allowing low-drive external references to be used. This feature makes the ADS807 well suited for multi-channel applications, such as ultrasound medical imaging, where the gain and offset matching of each converter is important.

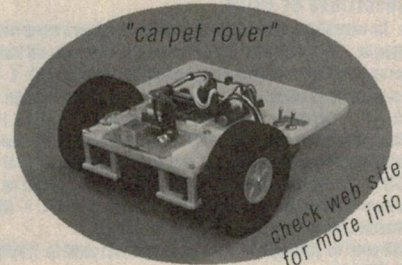
Key features and specifications include



82dB spurious free dynamic range (SFDR), 0.5LSB DNL and a flexible input range (2Vp-p to 3Vp-p).

For more information circle 275 on the reader service card or contact Kenelec, 2 Apollo Court, Blackburn 3130. ♦

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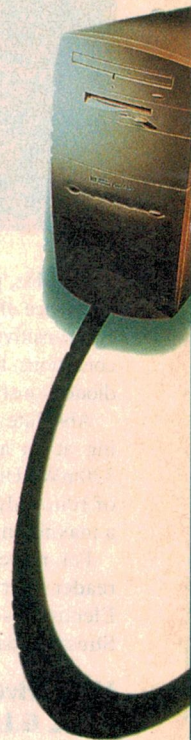


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That's right — subscribe or renew your subscription to **Electronics Australia** NOW, for 12 issues at the discount price of **\$55** (saving **\$16.40** on your normal cover price), and you'll be automatically entered into the draw to win a Hewlett-Packard 54810A Infinium Oscilloscope, valued at **\$20,813 (RRP)**.

HP's new Infinium family of oscilloscopes employ leading-edge technology to achieve outstanding levels of performance, combined with intuitive ease of use. They provide the very latest digital sampling, signal processing and display technology, together with an internal PC with customised Windows 95 graphical user interface. This allows you to not only set up the scope faster and more confidently than ever before, but also to save and recall both setups and measured waveforms — and also transfer them to your PC, for use in documents and reports. The inbuilt Windows GUI is mouse-driven and very intuitive, and even includes a full on-line, context sensitive help system — so there's no need for the traditional weighty user manual!



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1. The competition is open to Australian residents authorising a new or renewed subscription to Electronics Australia magazine. Employees of IPMG, Hewlett Packard, their subsidiaries and families are not eligible to enter. 2. Prizes are not transferable or exchangeable and may not be converted to cash. 3. The judge's decision is final and no correspondence will be entered into. 4. The competition commences on October 12, 1998 and closes last mail on February 23, 1999. 5. The draw is at the promoter's premises on March 2, 1999 at 11 am and the winner will be announced in The Australian, issue date March 4, 1999, and notified by mail. In the event of any unclaimed or unwanted prize, a second chance draw will be conducted on June 23, 1999, subject of Reg. 37 of the Lottery & Gaming Regulations 1993 (SA). 6. The prize is a Hewlett Packard Oscilloscope valued at \$20,813 rrp. 7. Total prize value \$20,813 rrp. 8. The promoter is FPC Magazines, 180 Bourke Road, Alexandria, NSW 2015. 9. All entries become the property of FPC Magazines, and may be used for future marketing purposes. NSW permit No. TC98/7908; VIC permit No. 98/3629; ACT permit No. TP98/0953; SA permit No. 98/2955; NT permit No. NT98/2412.

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## HURRY! OFFER ENDS FEBRUARY 23, 1999



# The most valuable prize we've ever offered!



Photo shows four-channel model — prize is two-channel model

The PC inside Infinium oscilloscopes is based on an AMD K6 processor running at 200MHz and with 512KB of L2 cache, which allows waveforms to be updated at more than 1750 waveforms/second. It provides a waveform annotation feature (great for documentation), and along with standard I/O ports it even includes a 10Mb/s Ethernet port for LAN connectivity.

The HP 54810A Infinium Oscilloscope offers two vertical input channels, with a top sampling rate of 1GS/s and a maximum bandwidth of 500MHz, with 32K of memory depth per channel. It also offers an easy-to-drive 'analog like' front panel, plus a big and bright high-res LCD colour display screen. The controls are even colour coded to the channel traces, to minimise confusion. Setups can be easily saved and recalled from floppy disk, and the mouse-driven Windows GUI allow very intuitive 'drag and drop' operation for carrying out measurements.

**In short, it's a truly superb instrument that would be a great asset to any home or professional lab — and it could be YOURS, if you're the lucky winner of our subscriptions draw!**



# New Products

## Wireless linked indoor/outdoor thermometer

There are many indoor/outdoor thermometers available, but according to Jaycar Electronics none is as versatile as their new QM-7220 Wireless Indoor/Outdoor Thermometer — which uses a UHF link to avoid the need for physical wiring.

The new product will support up to three remote sensors, which can be placed anywhere you like. The sensors transmit to the main unit which is usually mounted in the house or office. You can monitor a wine cellar, garage or nursery etc, all from the one unit.

The main unit features a high/low alarm for every sensor and minimum and maximum reading with a temperature range of  $-5^{\circ}\text{C}$  to  $+50^{\circ}\text{C}$ . The remote sensors are splashproof and have their own digital temperature display; they can transmit up to 30 metres.

The main unit (Cat. QM-7220, \$119) is supplied with one sensor, while extra remote sensors (QM-7221) can be purchased for \$49 each. Both units are available from any Jaycar Electronics showroom, or by mail order from Jaycar Electronics, PO Box 185, Concord 2137.



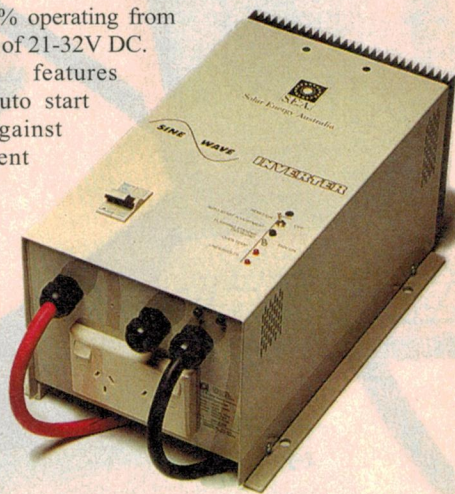
## 1500W sinewave inverter

Having recently entered the growing renewable-energy marketplace, Solar Energy Australia has just re-released a 1500 watt unit in their expanding range of high performance, competitively priced inverters.

Designed for medium sized remote power applications, the 1500W 24 volt SEAP-24-1K5 sinewave inverter has a half-hour rating of 1800W and a surge rating of 3900W. Its 240V/6.25A AC output is available via an internal DIN rail with terminal block and it has a

peak efficiency of 93% operating from an input voltage range of 21-32V DC.

Other standard features include adjustable auto start and protection against short circuit, current overload and thermal overload. It conforms to AS3100 wiring standards, is Year 2000 compliant and has dimensions of 400 x 250 x 198mm. There is a 19" rack version available on request. Its enclosure protection rating is IP20. List price is \$1995, which represents a 13% reduction since it first entered the market. The new inverter carries a full two-year warranty.



For more information circle 241 on the reader service card or contact Solar Energy Australia, 11/24 Stud Road, Bayswater 3153.

## New Tek DSO's offer 5GS/s on all channels

Tektronix is now offering a C-version of its popular TDS600 digital storage oscilloscope family. Ideal for engineers wrestling with design validation and characterization challenges, the TDS654C, TDS680C and TDS684C all offer 5GS/s (gigasamples/second) on all channels simultaneously, providing accurate edge definition and high-resolution for timing measurements.

The TDS600C Series include a built-in histogram function and automatic measurement statistics. The three models also support Java-enabled, application-specific measurement solutions. Optional hard disk drive and external Zip drive support enable greater storage capacity and quick archiving of important waveforms for documentation purposes.

The TDS684C provides four channels at full bandwidth.

For more information circle 242 on the reader service card or contact Tektronix Australia, 80 Waterloo Road, North Ryde 2113.

## Overload protected milliohm meter

The new Hioki 3450 series of milliohm meters are highly suitable for production line measurements. They have been provided with enhanced over-voltage protection, minimising the risk of damage when, for example, making a transformer winding resistance measurement following a high-pot test with incomplete discharge.

The Hioki 3450 series is available in a number of versions including RS-232 serial interface. All models have a com-



parator function providing a Hi-Lo as well as a REF mode. The highly accurate four-terminal method of resistance measurement is employed, making analysis independent of lead resistance. A temperature correction feature is also incorporated.

For more information circle 244 on the reader service card or contact Nilsen Technologies, 150 Oxford Street, Collingwood 3066.



## Micro-based educational kit

LED FUN is a microprocessor based electronic kit designed in response to a request from high school teachers to provide an easy to construct, yet fun and useful project for first-time electronic construction by students. It is intended to make electronics easy and fun so that the students maintain their interest at a high level. Hence eight different modes have been designed to fuel the students' imagination, effectively making this an 8-in-1 kit. Special care has also been taken to minimize problems for first time constructors in recognition, placement and soldering of components. Documentation is clear, precise and informative.

For the school, the kit is extremely cost effective, as it must be with large numbers of students running on a limited budget. On the other hand, the kit is comprehensive enough to practically demonstrate and apply most basic elements of practical electronics as well as some more advanced concepts. Special teaching documentation will be provided to help the class teacher cover the necessary class topics.

As this kit is microcontroller based, a teaching course on microprocessor programming, based on this kit, will also be released shortly for teaching students in higher grades. A cost effective PC based development programmer and re-programmable chips will also be available.

Modes available in the LED FUN kit are Random LEDs, Variable Chaser, Binary Countdown/Alarm, Ladder/Reaction Timer Game, Blinking Face, Doorbell/Alarm, Memory/Sequence Game and Authentic Pattern Dice.

For more information circle 243 on the reader service card or contact Labtronics International (Australia), 4/650 North East Road, Holden Hill 5088. ♦

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# SILEX and Optical Satellite Links

**As global demand increases for high-bandwidth links to convey multimedia data, telecommunications engineers are turning to satellites — but with optical links rather than microwave beams. The European Space Agency is well advanced in developing a system called SILEX, to test the infra-red optical systems that will be used for such satellite links.**

**by Geoff McNamara**

**I**NCREASING consumer demand has sparked a new method of satellite communications. Ordinarily, satellites talk with each other and ground stations at radio frequencies. Soon a new breed of satellites will use infrared lasers to talk with each other, with data transmission rates up to 2.488Mb/s — enabling real-time multimedia transmission.

But as the designers of these laser satellites have learned, the improved data transmission rate comes at a cost: to overcome the relatively feeble laser beams, satellites must be capable of pointing at their targets with unprecedented accuracy. Luckily early tests of one of the first civilian laser-equipped satellites are showing that satellite designers and engineers are definitely up to the task.

Satellites can be placed in Earth orbit at various altitudes, with different advantages and disadvantages. An Earth observation satellite in low-Earth orbit (LEO), for example, is closer to the ground and so not only can get away with a weaker signal (for both receiving and transmitting), but is also able to see the Earth's surface at higher resolution. But these advantages are dampened by the fact that the satellite can only remain in contact with a single ground sta-

tion as long as it's over the satellite's local horizon. If there's no ground station in sight, the satellite has to store the information on board for later transmission. The way around this problem, of course, is to have many ground stations around the globe, so that from any given station the satellite is above the horizon.

One alternative is to relay the signal to another satellite in the same altitude orbit, as in the latest mobile phone satellite constellations like Iridium and Teledesic — see *EA* April 1997. But this means lots of satellites that have all been designed to do pretty much the same thing.

A much more efficient idea is to relay the signal through a satellite in a higher orbit. A satellite in a geo-stationary Earth orbit (GEO), for example, is able to see more of the Earth — and its attendant LEO satellites — at any one time. Further, GEO satellites can be permanently perched over a single ground station.

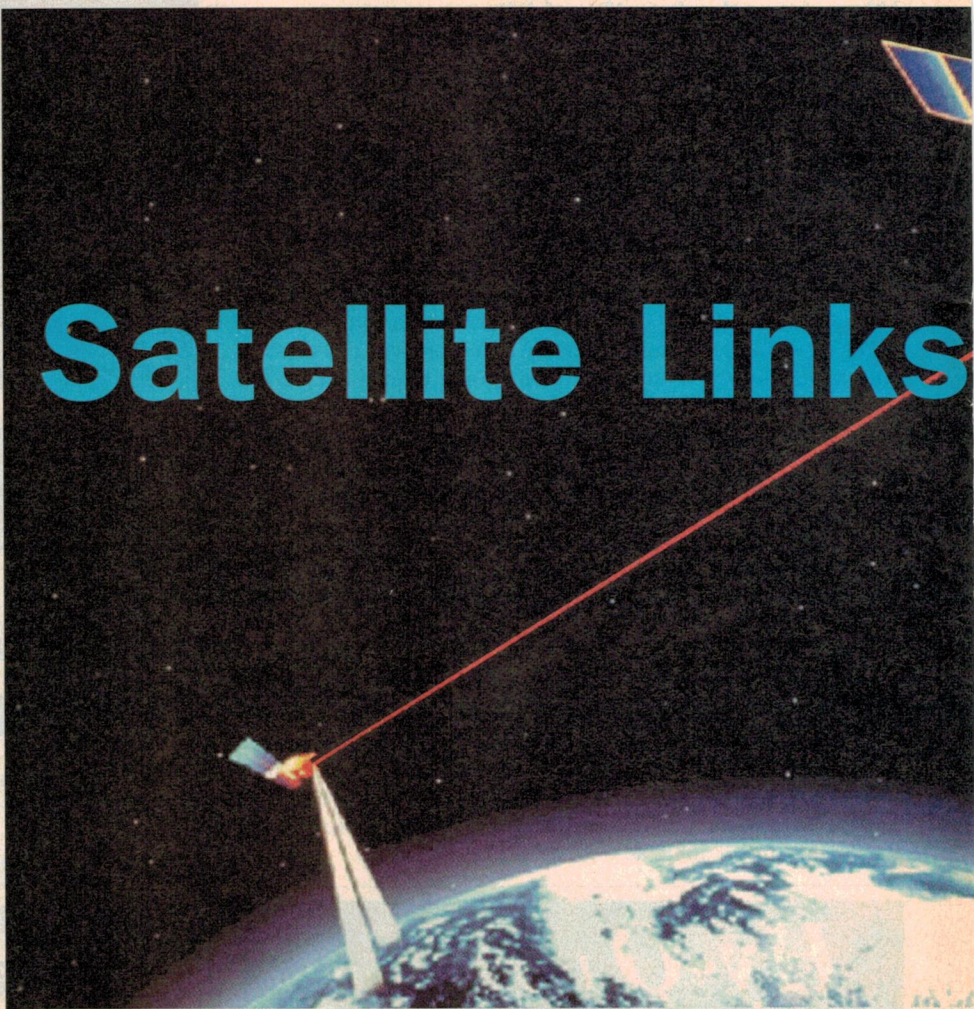
Inter-satellite communications has sparked the laser communications systems currently being developed by the European Space Agency (ESA). Laser communications is an attractive option: not only are the potential data transmission rates much high-

er than currently possible (some of the latest systems are capable of transmission rates up to 2.488Gb/s), but the equipment needed for optical communications is smaller and lighter than RF transmitters, less expensive, and poses a much lower risk of interference with other systems.

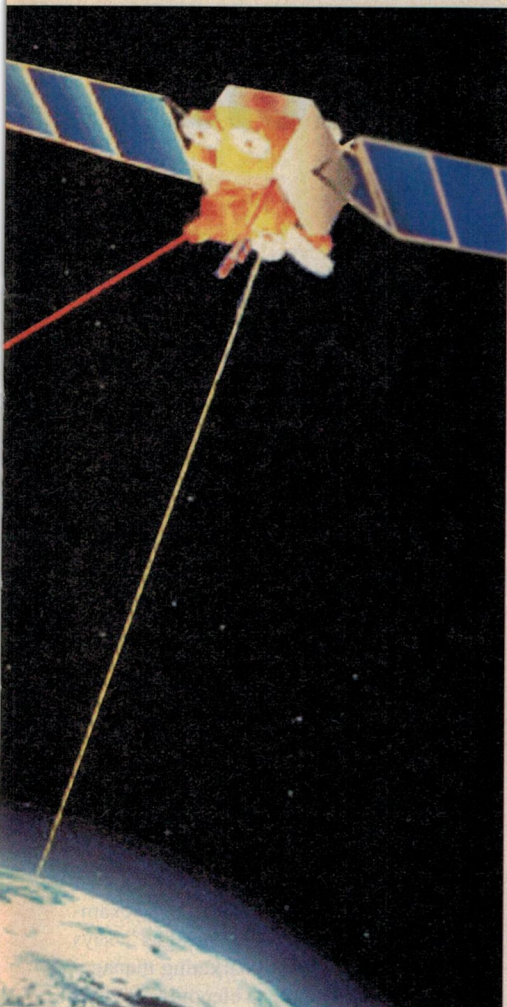
With these advantages in mind, ESA developed a laser communication system called SILEX — an acronym for the Semiconductor Intersatellite Link EXperiment. The aim is to link a satellite in low Earth orbit with another satellite in a geostationary Earth orbit. To test the system, French Earth-observation satellite Spot 4, launched in April 1998, will communicate using a laser with another satellite called ARTEMIS which will be placed in GEO early in the year 2000.

Orbiting at an altitude of 800km, Spot 4 will take detailed images (down to 10 metres resolution) of the Earth's surface in visible and near infrared wavelengths. ARTEMIS, which will orbit the Earth at an altitude of 36,000km, is a multipurpose telecommunications satellite designed to provide (among other things) direct satellite-to-satellite communications for mobile phone applications.

As Spot 4 scans the globe, it will produce







up to 50MB of imaging data every second. Being so close to the Earth's surface enables Spot 4 to take such high resolution images, but it also means it will only be in contact with any one ground receiver for a very short time. Rather than rely only on a series of ground stations around the globe, Spot 4 will use an optical terminal called PASTEL (Passager Telecom) to transmit its data in real time to ARTEMIS.

To receive Spot 4's signal, mounted on the underside of ARTEMIS will be an optical terminal called OPALE (Optical PAYload for intersatellite Link Experiment). ARTEMIS will then relay the data to a central processing centre near Toulouse, France. Of course, Spot 4 won't be able to 'see' ARTEMIS all the time, and so for those periods when the two satellites are not in contact, Spot 4 will store its data on two 120GB capacity recorders or on a new 8.4GB static mass memory unit. The stored data can then be later dumped to ARTEMIS for relay to Toulouse.

Together, PASTEL and OPALE make up the SILEX system. The lasers that make it all possible use semiconductor GaAlAs laser diodes transmitting with a power of 60mW in the 0.8 to 0.85 micrometre wavelength

range. Such a link can be maintained over intersatellite distances up to 45,000km. The data transmission rates are 2Mb/s from ARTEMIS down to Spot 4, and up to 50Mb/s from Spot 4 up to ARTEMIS.

Keeping two moving targets in touch with one another is difficult at the best of times (see *EA* November 1996), but when the beam is a mere 60mW and the beam width is a mere two arc-seconds, the task is formidable. For example, the flight time of a beam of light passing between two satellites 40,000 kilometres apart is about a quarter of a second, and the beam will have diverged to about 300 metres diameter. During this time, however, the receiving satellite will have moved up to 2000 metres. A so-called 'point-ahead function' has been designed to anticipate the final position of the receiver telescope.

To help detect the laser signals, each satellite is fitted with a 25cm telescope. Once the satellites are in contact, they can keep track of each other's signal. But the real trick is getting the two satellites in contact in the first place. This is done via a process known as *acquisition*.

From its Earth-hugging orbit, Spot 4 will look out into space for a faint point of infrared light among the myriad stars. Acquisition begins with ARTEMIS emitting a broad, 'bright' 700mW beacon generated by a 19 laser diode array, in the general direction of Spot 4. When Spot 4 sees ARTEMIS, it detects the beacon and estimates ARTEMIS's movement across the sky. Spot 4 then emits a communications beam of its own towards ARTEMIS. When ARTEMIS sees this beam, it switches off its own beacon and begins estimating Spot 4's movement. The two satellites then start their communications lasers, and within two minutes there is a predicted 95% probability that both satellites will be talking happily with each other.

This unprecedented pointing accuracy (for a communications satellite) has yet to be tested fully, because ARTEMIS has yet to be launched. However, Spot 4 has already demonstrated its pointing capabilities by tracking the star Arcturus for over 10 minutes last April. This involved an aiming accuracy of less than one microradian — equivalent to pointing at a single floor of an office building in New York from Paris!

SILEX is not yet in operation, though both terminal flight models have been delivered. Even so, the development of even more advanced laser terminals is already well underway. One is SOUT, an inter-orbit link terminal capable of similar transmission rates but with a reduced mass (25kg). One of the innovative features of SOUT is an anti-vibration mount that helps isolate the terminal from the vibrations of the host spacecraft, reducing the demand on acquisition and



**The PASTEL flight model ready for optical testing in a thermal vacuum. At left is an artist's conception of the SPOT4 - ARTEMIS optical link.**  
(Pictures courtesy ESA)

pointing techniques. Another of SOUT's features is its weight: at 25kg, it is a fraction of the weight of the SILEX terminals (150kg).

Another system is called OMNIS, an optical terminal designed specifically for short-range optical links needed by the latest communications satellite constellations. At distances up to 7500km, OMNIS can provide two-way data transmission up to 2.488Gb/s. All of the optical terminals are being developed by Matra Marconi Space for the European Space Agency.

Optical intersatellite communications seems to be the way forward for the high data rates needed for the growing demands of multimedia. Although still in the early stages, the success of the initial Spot 4 test shows the feasibility of intersatellite laser communications, and its promise for the future. ♦

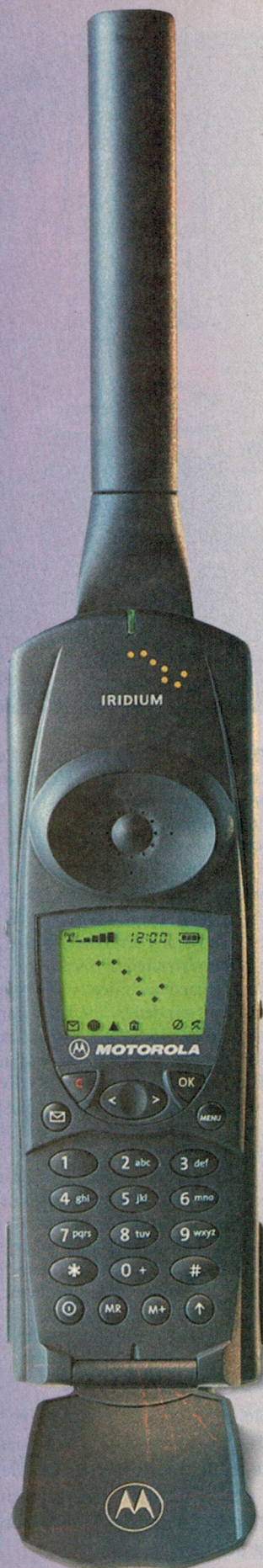
## Biographical Note

GEOFF McNAMARA is a freelance science writer based in Sydney, Australia and a frequent contributor to *EA*. He extends thanks to Francois Giraud of Matra Marconi Space for his help in preparing this article.



# Behold (and Hold) the New Satellite Phones

**Iridium's new satellite phone service is now available in Australia, as in many other countries, and subscribers will be able to make calls from virtually anywhere on the surface of the Earth. As Iridium says in its literature, all you need is one palm, five fingers and a need to communicate. Here's a look at how the new phones were developed, and the facilities they provide...**



**I**N EARLY 1992, the electronic components of a satellite telephone covered a large table in a Motorola design laboratory located in the suburbs of Chicago, Illinois, USA. At the time, existing satellite phones weighed 10 kilograms (22 pounds) and resembled a large briefcase in size. The engineers at this design lab had a formidable assignment: to shrink, by applying the latest communications technologies, a satellite phone until it could fit comfortably in one hand. "In those early days, the biggest challenge was to think of all the new elements needed in a handheld radio that could communicate with satellite base stations, as they move constantly in their orbits over 400 miles overhead", says Marty Seitz, senior resource manager in Motorola's Satellite Subscriber Products Division.

The handheld satellite phones of the Iridium system, which are the culmination of this design lab's efforts, represent a major leap forward in design and performance. Only recently has the idea of a handheld satellite phone become feasible, thanks in large part to advances in semiconductors, microprocessors, and manufacturing technologies. Not only will handheld satellite phones provide a freedom to communicate not previously possible, they will also have a significant impact on global communication. "It's exciting to be part of that first team to design and build a handheld satellite phone", says Brad Lohrding, a senior industrial designer for Motorola.

**Fig.1: Motorola's handheld satellite phone for Iridium. In use, the satellite-mode antenna is extended to be clear of the user's head, and can be pivoted to keep it vertical while using the phone at a convenient angle.**

Like any product, a handheld satellite phone involves a wide range of design considerations: ergonomic, aesthetic, technical, functional, and a host of others. The Iridium satellite phone has been seven years in development and thousands of hours of labour have gone into its design. "We examined more than 200 phone designs", says John Suzuki, a sales and marketing manager in Kyocera's Mobile Telecom Devices International Sales Division. "Each customer will choose the Iridium products that meet his or her own needs", he says.

After Motorola licensed the Kyocera Corporation of Japan, Iridium LLC had two world-class manufacturers to build Iridium handheld satellite phones.

A world leader in wireless communications and electronic equipment, systems, components and services, Motorola built its reputation in the 1930s with mass-produced automobile radios. Later it built the Walkie-Talkie wireless portable radio. In 1984, Motorola introduced the first handheld, portable cellular phone.

Kyocera, founded in 1959 as a company specializing in the production of fine ceramic components (the company's name is derived from Kyoto and ceramics) has become a leading manufacturer of ceramic integrated-circuit packages, as well as electronic components and equipment. Kyocera is also a leading wireless phone supplier, which brings years of design experience to the Iridium phone. "Our marketing and engineering groups worked closely together to visualize how we would offer the Iridium phone", says Suzuki.

Using satellite communications technology Motorola developed for the Iridium system, the two manufacturers set out to build handheld



satellite phones. Perhaps the most challenging task was determining the size and shape of the antenna. Previous generations of satellite telephone systems relied on a large stationary antenna, which a user had to point directly at a geostationary satellite located 36,000 kilometres (22,300 miles) overhead. Iridium phones, however, take advantage of a low-orbiting (780km, or 485 miles above the Earth) satellite constellation, allowing the user freedom of movement while operating the phone.

As engineers established the configuration and capabilities of the Iridium satellite network in the early 1990s, satellite signal strength — which affects the power requirements and antenna configuration — was quantified. "There are an infinite number of locations for the Iridium satellites relative to the user, so the antenna's view of the sky has to be hemispherical — from horizon to horizon", says Bill Zanchi, a director of marketing and business development for Motorola.

At the same time, an Iridium phone's antenna needs a clear line-of-sight to the satellites overhead. "You can't significantly block that line-of-sight", says Zanchi. "That's why the antenna has to be above the user's head. We've designed our phone so it will not make a satellite call unless the antenna is properly deployed."

From the early- to mid-1990s, Motorola engineers and product designers worked to demonstrate the practicality of communicating between Earth and the (then unlaunched) rapidly moving, low-orbiting satellites of the Iridium system. "Our first proof-of-concept package, which included a separate satellite handset and antenna, was built into a suitcase the size of a carry-on bag", says Seitz. "That was in early 1993. A later version, used in flyover transmission tests in 1995, was the size of a transportable cellular bag-phone."

After engineers proved the basic communications design that would allow Iridium phones to function as satellite receivers and terrestrial wireless radios, they faced another daunting task: miniaturization. Reducing the size of their phone to an easy-to-use, handheld product posed an enormous technological challenge.

The most significant design consideration related to miniaturizing a phone is accommodating its battery. Anticipating that many Iridium customers would need to use their phones for long periods between battery recharging, Motorola and Kyocera both designed extended-use batteries.

Kyocera settled on one standard battery for its satellite phone adapter, allowing almost two hours of talk time — the length of time you can talk on your phone before recharging the battery — and approximately 24 hours of continuous standby time — the length of time you can leave your phone turned on before its battery runs down. Motorola developed three separate battery options, including an ultra-high-capacity, larger-sized battery

**Fig.2: Kyocera's 'Multi-Mode' phone, which combines any one of four different cellular phones (CDMA, TDMA, GSM or analog) with a single adaptor body/cradle for satellite operation. Here it's shown with the satellite adaptor's antenna either retracted or extended.**

for use exclusively with Iridium World Satellite Service. "When you're outside of any cellular roaming area, depending strictly on the satellite phone for all your communications, you can insert the five-and-a-half-hour talk-time battery", says Zanchi.

## Multi-standard phones

BY 1996, DESIGN engineers were not only given the task of developing a handheld satellite phone. Their assignment now also included a new technological concept: a multiple-standard phone that would accommodate the incompatible cellular networks around the world. The three major digital wireless telephone standards — Code Division Multiple Access (CDMA), Time Division Multiple Access (TDMA), and Global System for Mobile Communications (GSM) — as well as the advanced analog wireless telephone standards (such as AMPS and TACS) are all incompatible with each other.

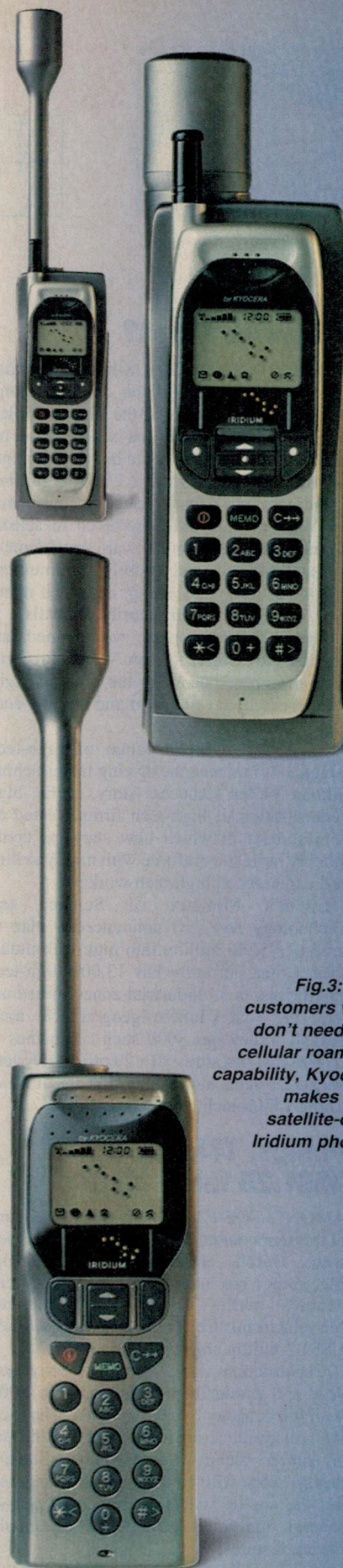
Each company's designers developed unique methods of accommodating incompatible cellular networks, as well as the Iridium satellite network. The Motorola 'dual-mode' phone features a Cellular Cassette which is inserted into the phone to make it compatible with a local cellular network.

Kyocera's 'multi-mode' phone consists of a combination of four cellular phones and an Iridium satellite adaptor unit. Customers may purchase any or all of the cellular phones, each of which operates on one of the leading technology standards. For cellular 'roaming', users will select the phone that matches the technology standard of the local network. For satellite calls, any of the cellular phones can be inserted into the adaptor unit for accessing the satellite network. For customers who don't require a cellular roaming capability, Kyocera has designed a separate satellite-only phone.

## User interface

THE USER INTERFACE was also the focus of intensive design efforts. A numerical keypad, function buttons and liquid-crystal display screen, as well as the operating software that determines how and which buttons are pressed to make calls and access services, required design solutions.

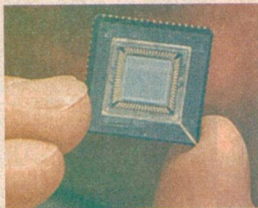
Kyocera's designers combined a number of operations in a large button located between the screen and the keypad. Known as a 'rocker key', it pivots up and down and can be pressed as well. "Multifunction keys like the



**Fig.3: For customers who don't need the cellular roaming capability, Kyocera makes this satellite-only Iridium phone.**

(Continued on page 93)





# Silicon Valley Newsletter.....

## Great wall of silicon for China?

THERE'S A Silicon Glen, Silicon Mountain, Silicon Desert and Silicon Island, among other attempted clones of the Silicon Valley business model. Now China is ready to set up its own Silicon Valley-style high tech oriented industrial area, with a US\$170 million investment in a newly created business area for Western companies involved in selling products ranging from software development tools, satellite-based mobile communications, electronic publishing, high-tech materials, construction and security firewalls.

The US-China venture was formed last year as the 'China Silicon Valley Project', with an aim of becoming the premier high-tech research, development and training centre in China.

Clustering a broad range of high-tech companies has been the driving factor behind Silicon Valley's success story, as the high concentration of high-tech firms created an environment in which new start-ups could quickly build a workforce with highly skilled and experienced high-tech workers.

China's Ministry of Science and Technology has now announced a plan to invest US\$240 million into high-tech industries. China currently has 13,000 high-tech enterprises, in 53 industrial zones spread out over the vast Chinese geographical area. Silicon Valley has 8000 such companies in an area that measures 20 x 20 miles. Hewlett-Packard's sales alone exceed those of all of China's high-tech companies.

## Philips, TSMC in US\$1.2B fab venture

AMONG THE FAINT signs that a rebound of the semiconductor industry may be underway, Dutch electronics giant Philips Electronics has announced plans for a joint venture with Taiwan Semiconductor Manufacturing Co. (TSMC) to build a new US\$1.2 billion chip fab in Singapore.

Construction will commence early next year and production could begin in 2000, with full capacity by 2002 or 2003. The facility will produce advanced ICs for Philips' consumer electronics products. Starting design rules will be 0.25 and 0.18 micron, but the facility will be designed to manage several additional generations of smaller device features.

Philips will own 48% of the factory, in

which TSMC will have a 32% stake and EDB Investments will own the remaining 20%. Philips also owns 27% of TSMC, and the two have cooperated on many projects since 1987.

## National Semi closing chip plant in Scotland

WITH DEMAND for analog ICs at dismal levels, National Semiconductor announced it is closing part of its chip manufacturing facility in Greenock, Scotland — a move that will put out of work some 600 of the 1000 workers at the facility.

The move will cost National US\$25 million in charges against profits. The company said it hopes to be able to sell the facility if it can find an interested party. According to National, there is no chance that conditions in the analog IC market could improve to such a degree in the next 12 months that the company could justify keeping the Greenock plant open.

"We currently have the equivalent of one factory too many to meet the business level of the next four to five years", said National Chief Executive Brian Halla in a statement.

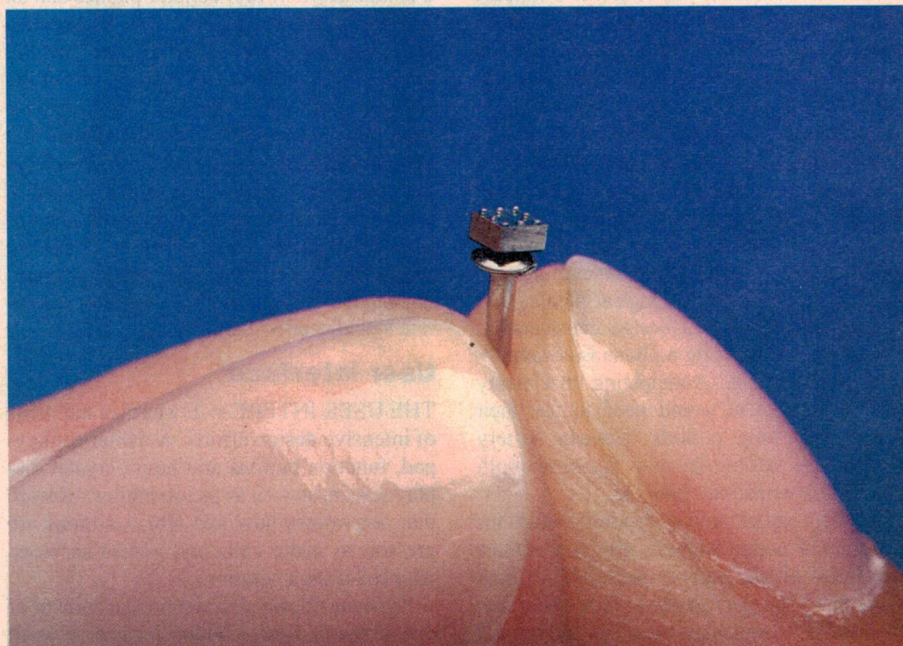
## Chip sales may be turning around

EITHER THINGS couldn't possibly get any worse or the global chip market is starting to turn around, as worldwide IC sales finally rose compared to a preceding month, according to the Semiconductor Industry Association based in Silicon Valley. The increase in August chip sales to US\$9.81 billion from \$9.67 billion was just 1.5%, but it was the first increase since November 1997.

In a sign that at least *some* markets are starting to show some sales growth, the August increase came in spite of continued serious problems in the Japanese market — which appears in danger of falling from second to last (fourth) among the major geographical IC market regions during 1999.

August chip sales in Japan, in dollar volume, were a stunning 30% below August 1997, the steepest drop ever recorded in any IC market since the SIA started to track market order and sales activities. Much of that decline, however, is due to the slide of the yen versus the dollar.

"Given all of the volatility in the global markets, these numbers are a positive sign



*It isn't just microprocessors and memory chips that are shrinking, getting faster and more powerful — it's happening even with analog chips. This new dual op-amp from National Semiconductor fits 114 transistors into a chip that fits on the head of a pin, yet is twice as powerful and 50% smaller than similar chips produced only six months ago... (BusinessWire photo)*



for the semiconductor industry", said SIA president George Scalise. "We are cautiously optimistic about the industry's prospects for additional gains in the fourth quarter, because it's traditionally the most active chip quarter of the year."

The North American IC market had a 3.4% increase in business, while Europe grew 0.7% and Asia-Pacific increased 3.1%. Sales in Japan fell 2.2% from July (in Yen, sales declined 0.1%).

## Intel cuts jobs at Digital plant

INTEL SAID it will cut 675 jobs at its Hudson, Massachusetts, chip manufacturing plant, which it acquired from Digital Equipment earlier this year. The cuts represent nearly half the plant's workforce and are in addition to the 3000 people Intel has previously announced will be laid off in the coming months.

Intel acquired the plant from Digital as part of Intel's US\$625 million acquisition of Digital's semiconductor business in May, a deal that ended the patent infringement lawsuit Digital had filed against Intel.

## Used parts cost Packard Bell \$3.5M

CONSUMERS WEREN'T the only ones who bought Packard Bell computers between 1989 and 1995 that incorporated used parts. The company also sold such systems to the US Defense Department, and now Packard Bell NEC has agreed to pay a US\$3.5 million fine to the US Government to settle a federal lawsuit.

The company stopped the practice of putting used parts in its computers in 1995, when an employee blew the whistle and set off a series of lawsuits, including one from Compaq. The controversy surrounded Packard Bell's practice of stripping computers that were returned by customers under warranty and using the good parts in its production of new machine. While hardly used in many cases, the practice was deemed to amount to consumer fraud.

## SVG lays off 300, closes UK facility

CHIP EQUIPMENT maker Silicon Valley Group added to a recent series of layoff announcements by shutting down a British-based facility where 40 people work. In all, SVG is laying off an additional 300 workers, most of them in Silicon Valley.

SVG has been hurt by two years of weak sales of IC production equipment, as the global semiconductor industry continues to struggle to overcome an abundance of production capacity that has caused plans for new plants and equipment to be delayed or put off altogether. The economic crisis in Asia, where dozens of new chip fabs were

scheduled to be built during the next two years, is also preventing chip companies from obtaining finance for new \$1-3 billion fabs — which are considered highly risky business ventures in today's IC market environment.

SVG said sales for the fourth quarter which ended October 2, will fall 10 - 15% from those in the third quarter, when it had revenues of US\$116.4 million.

The latest round of firings brings the total number of laid off SVG workers this year to 1220. "These are very difficult times", said Papken Der Torossian, chairman and chief executive. "We expected explosive growth in 1998, but many Asian economies went into recession."

## LG and NEC to battle over patents

KOREA'S LG SEMICON has filed a patent infringement lawsuit against Japan's NEC. LG claims NEC is infringing on eight of its personal computer-related patents. In addition LG is asking the court to rule that technology deployed in its personal computers does not violate any of 10 possible NEC patents. LG apparently acted because it expected NEC to file a patent infringement lawsuit of its own against LG.

Among the eight patents NEC is accused of violating are a patent covering a video compression system, which NEC is using in its 'Ready' personal computers. Also a multiprocessor system with so-called cache memories are allegedly infringed upon by NEC in its SuperScript 870 printer. 'NEC has caused and will continue to cause irreparable harm to LG Semicon unless NEC's infringement is enjoined by this court', the suit says.

"It was a surprise to our legal group" said Joany Draeger, an NEC spokeswoman.

## AMD announces surprise profit

ADVANCED MICRO DEVICES has surprised Wall Street with a third-quarter profit driven by strong demand for the company's K6 Pentium-compatible microprocessor. AMD's earnings of US\$1 million compared to an expected loss of around \$15 million, which had been the general expectation in the investment community.

A year ago, AMD lost US\$31.7 million. Sales for the Sunnyvale chipmaker rose from US\$596 million a year ago to \$686 million. AMD sold 3.8 million K6 processors in the third quarter and overall K6 sales jumped 70% over the preceding second quarter.

Company chief Jerry Sanders III attributed the much improved results to improvements in manufacturing efficiencies and sales execution. "We are extremely pleased by the strong demand in the retail channel for personal computers powered by AMD-K6-2 processors." ♦

## Intel & Netscape invest in Linux firm

IN FURTHER evidence of possible cracks in the WinTel corporate tandem, Intel has made a major investment in Red Hat Software, a leading developer and distributor of Linux operating system software. Netscape and several major venture capitalists are also investing in Red Hat.

More than anything, the investment by Intel signifies another major endorsement for the Linux shareware-based operating system, whose popularity is growing rapidly in both Unix and Windows-based user communities. Linux is Unix-based, but runs on Intel-based computers as well as on workstations from Sun Microsystems, HP and others. It was created in 1991 by Finnish programmer Linus Torvalds and is still used mostly by engineers and programmers. In all, an estimated eight million users around the world are now considered part of the Linux community.

Thousands of programmers develop new features and code enhancements for Linux. Most are submitted to Torvalds, who adds worthwhile changes to the source code and then leaves the software to be tested again by the community.

Linux's growing popularity is due in large part to its reputation as being far less crash prone than Microsoft's Windows NT. But to date, many large companies have stayed away from Linux because the software is free and not owned by any particular company with whom system administrators can work in case of problems. "With the right support, Linux could crack the commercial market", said Jon Oltsik, senior analyst at Forrester Research. "The right support means visible vendors there to answer calls when things are not running right, rather than a federated group of software programmers."

Red Hat, based in Research Triangle Park, North Carolina, is perceived to be a forefront company to lend such much-needed corporate accountability to Linux. Red Hat charges \$50 for its version 'Red Hat Linux', and provides the customer support that is rarely available elsewhere in the Linux community. Red Hat also sells its version through the computer retail channel.

Analysts played down the significance of the Intel move with regards to support for Windows, saying Intel is merely placing a small bet on a promising technology that supports its microprocessor platform.



# IL-2000:

## real-world interfaces for your PC

Controlling external hardware with a PC is often a troublesome task, and there are surprisingly few ways of going about it. Kim Welch of InterLink-2000 has come up with an eminently practical system that lets you control a huge number of devices over an ordinary serial link. Available in kit form, the IL-2000 series of interface modules are a cheap and simple solution to almost any monitoring or control problem — and they're easy to use, too.

by Jean-Baptiste Cattley



The stereo switching and equaliser modules are shown here, with the microcontroller core board visible on the right. Behind is a selection of manuals and software, each designed for a specific IL-2000 module.

IF YOU'VE ever tried to set up any kind of home automation or process-control system, you've probably thought of using a PC as the 'brains' of the operation. They're easy to program and maintain, and if you're like most *EA* readers, you'll probably have an old XT or 286 gathering dust in a corner somewhere.

The only trouble with this approach is that PCs weren't really designed for this kind of application, and have severely limited I/O capabilities. A number of I/O port extenders have been designed over the years, but these generally aren't very flexible, and require specialised software to drive them...

One interesting solution to this problem is the IL-2000 series of modules, developed by Kim Welch of New Zealand firm InterLink-2000 Network Systems. The IL-2000 series use a standard serial interface (as found on virtually every PC) and a simple text-based control language, giving you huge flexibility and the ability to easily interface it to an existing system. What's more, multiple devices can be daisy-chained together to create a network of as many devices as you need.

Each IL-2000 device consists of a central microcontroller core board (specifically programmed for the task it is to perform) linked to a separate sub-board containing the appropriate 'application hardware'. The core board receives commands sent to it via its RS-232 interface, and directly controls the sub-board over three 8-bit digital buses. Each core board can be configured with its own unique address, allowing you to control a large number of different controllers, all over a simple three-line serial cable.

There are over a dozen different devices to choose from, including analog or digital I/O, IR decoding, audio and video switching and control systems, a digital radio controller,



and even a Teletext interface.

Mr Welch very kindly sent us his entire range to test, many of which were wired up as ready-to-go demo units. Faced with this embarrassment of riches, I decided to start with an audio switching module called, rather cryptically, the AUO(X). The AUO(X) consists of a CPU core hooked up to a two-channel stereo audio switch, combined with volume, bass and treble settings, all running under software control.

## Adding EQ

THE DEMO module supplied also had the AUO(X)-EQ five-channel equaliser board already wired up, so all that was required was for me to plug the serial input into COM1 on my computer, and to hook up the box to the various bits of audio hardware I had lying around.

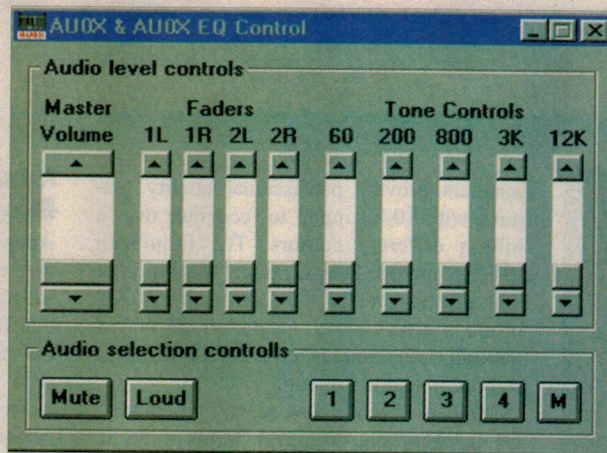
A couple of minutes later, with the Windows demo software installed, I could switch the output between radio, CD player and my soundcard with a single mouse click, and the AUO(X)-EQ's graphic equaliser settings were easily accessible by adjusting the slider controls.

Satisfied that my hardware setup worked properly, I then proceeded with the real test: sending control codes directly to the card, without any clever software to drive it. All-singing-all-dancing software is fine for off the shelf applications, but if you want to develop any kind of automated control system, you'll need to be able to access to the card directly.

All the IL-2000 modules feature a very simple text-based serial interface built right into the command module, so with the aid of an ordinary DOS terminal program, I was able to talk to the card in much the same way as you would control a modem. Thus I could type 'I1' to switch to audio input 1, 'I2' for input 2, and so on. All volume, tone and equaliser controls can be set in this way (as indeed can all commands for *all* IL-2000 devices), making a small BASIC or C++ program eminently feasible for controlling a custom setup.

Encouraged by the simplicity of the text interface, I daisy-chained in the ADC(X) analog-to-digital converter module, typed in its

'wake-up' code, and was immediately able to read values off any of its eleven 8-bit inputs, all without disturbing the bass-boosted, graphically equalized voice of Caetano Veloso coming through my CD player. Beautiful!



*This screen shot shows the Windows interface for the AUO(X)-EQ module, with this application controlling the volume for each of the four channels, as well as the equalisation, loudness and channel selection. You can also control the modules via a simple RS-232 interface, from a terminal or other software.*

The system can be extended almost indefinitely, with up to 15 of each type of module connected at once, and all controlled down one three-core cable plugged into COM1 of your PC.

## Command sender

AS IF THIS weren't enough, you can even do away with the computer altogether! Well, almost. One of the units available is the KBC(X) keyboard interface and command sender, which sits on the network and can send one of 32 pre-programmed command strings down the line at the press of a button. In this way, once the command sender itself is programmed, the host computer could be removed from the network completely. Feedback to the user could be maintained by the LCO(X) LCD display module, which means that a completely independent remote system could be established without the need for any computer hardware after the initial setup.

For the chronically unsatisfied, there's even a CPU programmer available, so you can develop your own custom modules if you want. If you have a specific piece of hardware you want to control, there's nothing to stop you from developing a CPU core to suit its exact requirements.

This open-ended approach makes the IL-2000 system very powerful indeed, and means that you don't have to worry about hardware compatibility; if a device isn't compatible with the system, you just *make* it compatible...

Each module is available as a separate kit, so you only need buy what you want. The kits are available as short form (containing pre-programmed CPU, PCB and manual) or full form, with everything you need for a specific application, and there's also a series of add-on kits available, offering mains switching, input opto-isolation, etc.

The kits are of surprisingly high quality, with decent manuals, too. And if your soldering skills are a bit rusty, a kit building service is available for a small fee.

More information is available from the Interlink-2000 website at <http://homepages.ihug.co.nz/~interkim>, where you can order a full catalog and preview the various kits and modules available. ♦

## InterLink-2000

A series of various I/O and interface modules, controlled over an RS-232 serial bus.

**Good points:** Very modular and easy to set up. Kits and manuals are of a very high standard.

**Bad points:** Some of the module names are a bit cryptic, but nothing to worry about.

**RRP:** Prices vary from module to module, but you're looking at around \$50 to \$80 each.

**Available:** K.S.G. Welch Electronics, 5/24 Tawhiri Rd., One Tree Hill, Auckland, New Zealand. Phone (or fax A/H): +64 9 622 0884. (Email: [interkim@ihug.co.nz](mailto:interkim@ihug.co.nz))

## Satellite Phones

(Continued from page 89)

rocker are becoming very popular with users, particularly in Japan", says Suzuki.

Motorola's phone achieves a similar effect by placing several important function keys above the keypad cover. "For our Iridium phone we adapted the interface designed for our (GSM model) StarTAC phone", says Lohrding. "With those keys placed outside

the keypad cover, the user can run through a variety of menu options, including message retrieval and setting user preferences, while keeping the cover closed."

As wireless communication continues to evolve, customers are looking for their phones to provide more than voice communications. Fax, data and e-mail messaging are becoming integral to wireless communications, and will be included in Iridium services offered through Motorola and Kyocera phones. In the future, more data-related features will be supported by

handheld satellite phones, as they are in other wireless communications products.

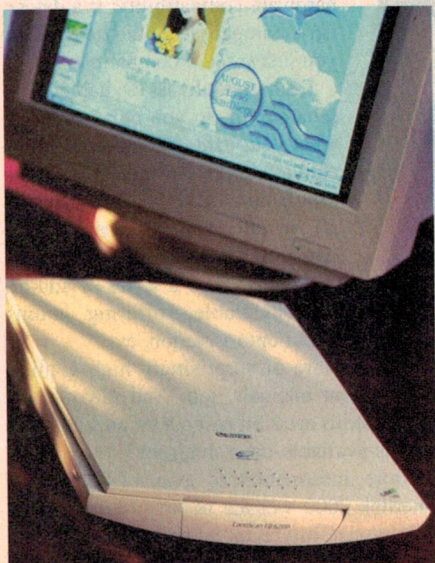
"When the Iridium concept was introduced to Kyocera, we were excited, as this is something everyone has dreamed about but has never yet happened throughout history", say Suzuki. "Challenging the Future" is one of our company's mottoes, and with the Iridium phone we are doing just that."

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# Computer

## News & New Products



### Canon scanners use new technology

Canon has introduced two new colour scanners, the CanoScan FB320P and CanoScan FB620P, featuring the company's new LED InDirect Exposure (LIDE) and Contact Image Sensor (CIS) technologies — said to deliver brilliant imaging with no distortion. Both models offer a slimline compact size with the top face only slightly larger than a sheet of A4-sized paper and a height of only 63mm, 25% less than previous models. Additional benefits include low power consumption for added value and easy-to-use scanning operations.

Measuring just 256 x 372.5 x 63mm (W x D x H) and weighing only 2kg, these A4

scanners provide professional quality features with 10-bit input, to recognise over a billion different colours. The CanoScan FB320P provides a true optical resolution of 300 x 300dpi, while the CanoScan FB620P offers a true optical resolution of 600 x 600dpi. Both scanners have selectable output resolutions up to 2400dpi.

LIDE is Canon's new scanning technology incorporating a novel light guide to replace the mirrors and lenses used in conventional scanners. Small rod lenses are placed across the scanning line to create a high resolution image that is read directly by Canon's new sensor. With the same width as the main scanning direction, 216mm, Canon claims the sensor faithfully scans every detail of an original without distortion.

The CanoScan FB320P and CanoScan FB620P have a standard parallel port connection to a computer or can be plugged in-line with a printer. Installation is easy with power supply and parallel cable supplied. Supplied software bundled on a CD-ROM includes a step-by-step guide to get users started; a tutorial on how to use the CanoScan; ScanCraft CS-P scanning utility for automated copying of colour, black and white images or text; iPhoto Express photo-editing software; and Caere's OmniPage LE for quick and accurate conversion of text-based materials into usable text data.

The CanoScan FB320P retails for \$229 and the CanoScan FB620P retails for \$299. For more information circle 160 on the reader service card or contact Canon Australia, 1 Thomas Holt Drive, North Ryde 2113.

### Cooling kit for hard drives

Jaycar Electronics has released a Hard Drive Cooling Kit to compliment its already extensive range of computer accessories. The kit is claimed to protect and extend the life of hard drives, at low cost.

The XC-5046 kit installs in any vacant 5.25" or 3.5" slot in minutes, and will dramatically improve the ventilation within the case using dual, high efficiency fans. The air filter is easy to access and the kit is supplied with 'Y' adaptor for easy connection into the HDD power cable.

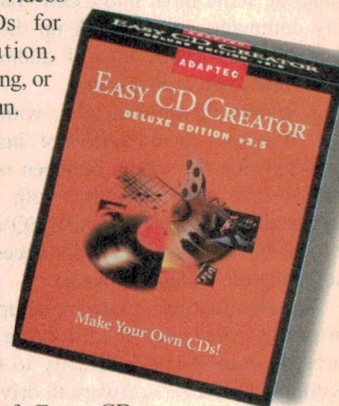
Priced at only \$39.95, the Hard Drive Cooling Kit is available at all Jaycar Electronics stores or by mail order from Jaycar Electronics, PO Box 185, Concord 2137.



For more information circle 166 on the reader service card.

### Adaptec upgrades Easy CD Creator Deluxe

Adaptec has announced the first major upgrade to its award winning CD-Recording/ReWritable software, Easy CD Creator Deluxe — version 3.5. The new package makes it easy to put photos and videos onto CDs for distribution, safekeeping, or just for fun.



One of Easy CD Creator Deluxe's hottest features is CD Spin Doctor, an application that lets anyone turn a personal analog recording (such as LPs, tapes, or custom recordings) into digital CDs. Easy CD Creator Deluxe 3.5 helps these features leap into the future with new 'real time' CD Spin Doctor, Sound Morph special effects capabilities, and the most impressive advancement - PhotoRelay.

Adaptec's Easy CD Creator Deluxe 3.5 is available now for an RRP of \$180 (inc. tax). Current customers of Easy CD Creator Deluxe Edition 3.0 can get a free upgrade to Easy CD Creator Deluxe Edition 3.5 by downloading the new software from Adaptec's Web site ([www.adaptec.com](http://www.adaptec.com)).

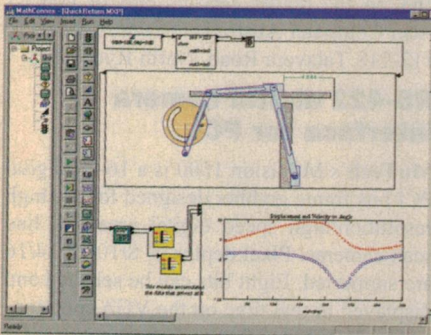
CD Spin Doctor Sound Morph special effects lets users change the characteristics of their personal recordings with features such as GenderBlender, Metalizer, Concert Hall, Reverb, TalkBox, and TimeWarp that give their custom music a unique twist. With PhotoRelay, users can take digital images and videos to create 'digital Photo Albums' that can be organised and saved to a CD in a Slide Show, Web Album (HTML), or Video Postcard format.

Adaptec's products are distributed by Anabelle Bits (02) 9384 8000; Agate Technology (02) 9878 4688; Synnex Australia (03) 9540 0555; and Tech Pacific (02) 9381 6000.



## Software for tech calculations

MathSoft International has introduced Mathcad 8 Professional, claimed to be the most advanced calculation application available for engineers, scientists and other technical professionals. It's marketed as the only desktop application that combines the maths, visualisation and collaboration power required to meet the demanding technical calculation needs of today's corporate environment.



Enriched with a new computer engine and broader support for complex problem solving, Mathcad 8 Professional offers enhanced analytical power, plus extended optimisation and linear programming capabilities. The increased power also extends to its visualisation, presentation and documentation features, with enhanced 3-D graphics delivering the speed, clarity, detail and control of a high performance workstation to an inexpensive Windows desktop.

The product provides complete support for OLE automation and so is an open and extensible environment able to interoperate fully with other desktop and engineering applications, including spreadsheets, CAD packages and technical products such as MATLAB, AutoCAD, Visio Technical and Imagineer.

Mathcad 8 Professional is available for Windows 95, Windows 98 and Windows NT 4.0 or higher, at an RRP of \$895 for a single-user licence.

For more information circle 160 on the reader service card or contact Hearne Scientific Software, Level 6, 552 Lonsdale Street, Melbourne 3000.

## Modules for PXI automotive testing

National Instruments has announced new modules that connect PXI and CompactPCI systems to communications networks that are used pervasively in automotive test applications. The new modules include a Controller Area Network (CAN) interface (PXI-8461), a Serial RS-485 interface with isolation (PXI-8423) and a Serial RS-232 interface with isolation (PXI-8422).

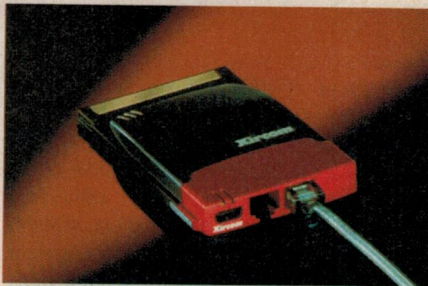
The interfaces give PXI and CompactPCI users connectivity to communications networks that are becoming more commonplace in applications such as automotive testing and diagnostics, factory automation, and machine control. PXI-based automotive test hardware is compatible with National Instruments LabVIEW, LabWindows/CVI and other industry-standard programming languages.

The PXI-8461 connects PXI and CompactPCI systems to CAN. It is fully Windows 95 Plug and Play compatible, giving users the benefits of automatic configuration for easier installation and maintenance. The PXI-8461 is available with one or two ports so users can monitor and control multiple networks.

The PXI-8423 and PXI-8422 connect to RS-485 and RS-232 devices, respectively. They include an enhanced COM driver for Windows 95/NT that transmits data at rates up to 115.2kb/s. Both use 16550-compatible UARTs for 100% compatibility with standard PC COM ports. The PC operating system performs all board configuration — no jumpers or DIP switch settings are required.

For more information circle 161 on the reader service card or contact National Instruments Australia, PO Box 466, Ringwood 3134.

## PC cards for LAN, WAN connections



Xircom Asia Pacific is now shipping the new RealPort CardBus Ethernet 10/100, RealPort Ethernet 10/100 and RealPort Modem 56-GlobalACCESS, the latest additions in a series of RealPort Integrated PC Cards for notebook PC users.

The RealPort CardBus Ethernet 10/100 is a high-performance 32-bit solution for connecting CardBus-equipped notebooks to 10Mb/s or 100Mb/s Ethernet networks via a robust, cable-free Integrated PC Card. The adapter's 32-bit bus-mastering architecture enables users to take full advantage of 100Mb/s Fast Ethernet networks. It offers Ethernet throughput of up to 80Mb/s — 400% faster than 16-bit 10/100 adapters, yet consumes up to 47% less power than competitive 32-bit CardBus PC Cards when

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operating at 10Mb/s and up to 13% less power when operating at 100Mb/s.

The RealPort Ethernet 10/100 provides 10Mb/s standard Ethernet and 100Mb/s Fast Ethernet connections in a cable-free Integrated PC Card. The RealPort Modem 56-GlobalACCESS provides 56kb/s modem and telephone handset pass-thru connections via a robust, cable-free Integrated PC Card, and is designed for world travellers.

The Xircom RealPort CardBus Ethernet 10/100 and RealPort Ethernet 10/100 are priced at \$275, while the RealPort Modem 56-GlobalACCESS is priced at \$324.

For more information contact Xircom Asia Pacific at 76 Shenton Way, Unit 06-01, Singapore 079119.

### New Bubble Jet with enhanced quality

Canon has released the BJC-4310SP, claimed as the industry's most versatile colour printer. With a retail price tag of \$299, the BJC-4310SP delivers photo-quality output with PhotoRealism, fast black printing, reduced running costs with Super Performance and optional colour scanning.

Using Super Economy Mode it can print four times more pages than normal mode, vastly improving operating economy. Ideal for draft printing colour, black and even fluorescent pages, this mode allows users to reduce their ink consumption by 75% and extend ink cartridge life. Up to 3600 pages can be printed in black and white using the BC-20 cartridge, and 800 black and 400 colour pages using the BC21e four colour ink cartridge (both are included in the box).

The BJC-4310SP also becomes a 360dpi colour scanner, when coupled with Canon's

optional colour image scanner head.

The BJC-4310SP is claimed to deliver near-photographic reproduction. The optional PhotoRealism3 cartridge achieves more colour combinations and increases the colour range by using low-density inks working together with the advanced printer driver to apply ink on a single dot many times. This produces up to five times as many colour combinations as conventional CMYK inks. Photo-quality output can be achieved on plain paper, including banners, in addition to PhotoRealism on special photo papers supplied by Canon.

For more information circle 162 on the reader service card or contact Canon Australia, 1 Thomas Holt Drive, North Ryde 2113.

### Powerful, lightweight A5-sized notebook PC



Acer Computer Australia has announced its mini A5 sized TravelMate 310 notebook series, bringing increased versatility to the mobile computing market. Weighing in at 1.3kg, this lightweight notebook is powered by the latest 233MHz Intel Mobile Pentium processor with MMX technology.

Also housed in its small, stylish metallic-grey casing is a 128-bit Neo Magic graphics accelerator, 32MB of EDO system memory (expandable to 80MB), ample storage capacity via a large capacity IDE hard disk drive, a very bright 8.4" TFT (thin film transistor) colour display, an integrated 56Kb/s data/fax modem, 16-bit Sound Blaster Pro-compatible audio system with integrated speakers and microphone, Acer's Heuristic Power Management for extended battery life, and a complete set of standard notebook ports, making external port expansion unnecessary. The mini A5's dimensions are 236 x 175 x 36mm.

Options include 64MB, 32MB and 16MB EDO memory modules, 10/100Mb/s Ethernet or Token Ring network cards, a Lithium Ion battery, and a Kensington

Microsaver Security Lock. In addition to Microsoft Windows 98, pre-loaded software includes Acer's Safe Off, Quiet Boot and Notebook Manager.

The Acer TravelMate 310 series of notebooks are available now at an RRP of \$3499 (including tax). For more information circle 163 on the reader service card or contact Acer Computer Australia, Tower A, Level 3, 112-118 Talavera Road, North Ryde 2113.

### RS-422 digital camera interface for PCI

MuTech's M-Vision 1500 is a 16-bit digital PCI bus frame grabber designed for the high resolution/high speed digital area and line scan cameras. Pixel depths of 8/10/12/14/16 are supported. Eight bits can be selected and displayed in real time on the VGA monitor.

The M-Vision 1500 can operate as a master or slave on the PCI bus and can achieve over 50MB per second sustained transfer speed in master mode. Unlike some frame grabbers, it does not lose lines under a heavy system load and can be easily programmed to interface to a wide range of digital cameras by loading a configuration (.ini) file.

The M-Vision 1500 interfaces to a wide range of digital video cameras at rates up to 40 million pixels per second. The digital video is stored in on-board VRAM or transferred in real time to system memory and/or the VGA card for display. Detailed application notes are available for cameras such as EG&G, Kodak, Hitachi, Daisa, DVC, Ternet, Optisense and Pulnix.

For more information circle 164 on the reader service card or contact The Dindima Group, 10 Argente Place, Ringwood 3134.

### Electronic whiteboard

TeamBoard, a new communication technology tool that captures, communicates with and educates the audience, has been released by Audio Visual Australia. It's an electronic interactive whiteboard that can be connected to a computer and then used for audio or video conferencing.

TeamBoard enhances the whiteboard concept by adding the power of your computer to capture what you write or draw in six colours. Users simply press a button on the TeamBoard to save or print what has been drawn. The information can be edited, published or e-mailed from your PC. TeamBoard draws directly into a variety of software packages such as Microsoft's NetMeeting; your finger acts as the mouse.

For more information circle 165 on the reader service card or contact Audio Visual Australia, 25 Jersey Road, Bayswater 3153. ♦





by **Graham Cattley**

**P**ARALLAX INC IS KNOWN the world over for its range of microcontroller modules, known affectionately as Basic Stamps. Their website at <http://www.parallaxinc.com> is, I suppose 'Stamp heaven', with masses of info on perhaps the world's most popular micro. You'll find a complete listing of every Stamp product, along with pinout diagrams and physical specs for the many different Stamps available, a whole page of Stamp FAQs, schematics, application notes and other articles, and even the entire Basic Stamp manual available in PDF format.

In the software section you can download all the Basic Stamp program editors (in both Mac and PC format), along with demonstration Stamp programs and example source code. And if your Stamp has you stumped, Parallax even offer free technical support via email — both through their own technical department, and through Dr Zahnert, an unbiased third-party who is quite familiar with a number of microcontrollers.

If you are running out of ideas for your next Stamp project, check out their Custom Apps page, which lists some of the more interesting applications that people have come up with for their Stamps, including pictures and source code for a Stamp-based robot featured in the *X-files*...

**CELL PHONES**, CD players, microwave ovens — if you want to know how they work you have two options: you can either pull them to bits, or hop along to <http://www.HowStuffWorks.com>. Here you'll find some very detailed accounts on

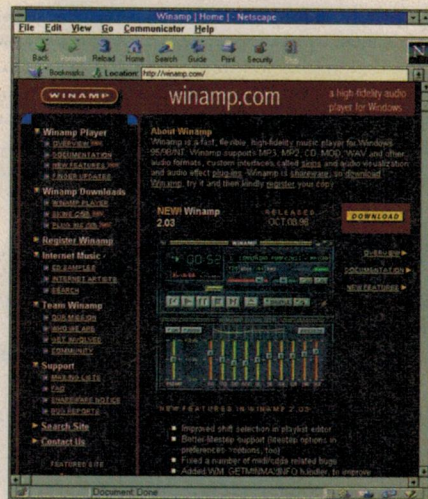
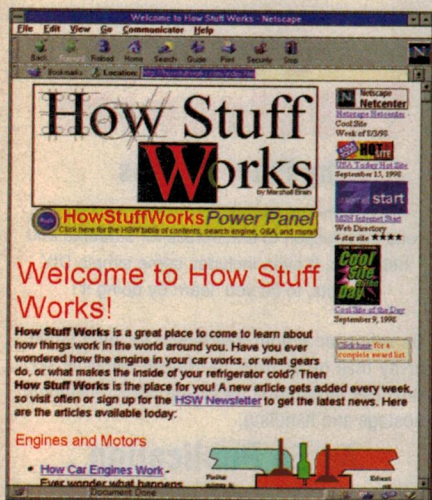
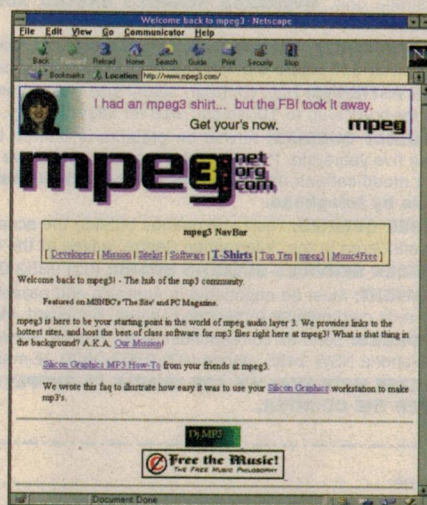
the internal workings of all sorts of everyday objects. Everything from digital clocks to helium balloons, the block and tackle to Boolean logic.

The page is presented (appropriately enough) by Marshall Brain, who is the author of a number of books on computer programming. His background in teaching certainly shows through in his site, as all the explanations are clear and concise, and go into more than enough detail to fully explain the principles behind the object concerned. A new article gets added every week, so it is worth checking back from time to time. Or you can subscribe to their free newsletter, for the latest updates.

All up, a great site, and I am indebted to *EA* reader David Wolfe for bringing it to my attention.

**THE LATEST CRAZE** on the internet is the MPEG Layer 3 Audio Compression standard, known as simply MP3. With it, you can achieve compression ratios of around 12:1, reducing a 15-minute recording to around 3MB. Because of the high audio quality and small file size, MP3 files are an ideal way to download music from the internet, and you aren't tied down to playing it through your web browser either — small shareware player programs like WinAmp (from <http://winamp.lh.net>) let you play MP3s on your PC in the same way as you would a WAV file. (You don't even have to play them on your PC — see the handheld MP3 player on page 8 of the November issue.)

As for the files themselves, there are thousands of sites out there offering everything from the latest hit single through to classical music. Your best bet is to try using one of the meta search engine pages — try <http://www.metafind.com> or <http://www.dogpile.com> which will collate the results from a number of different search engines. Just look for the words 'MP3' and the name of the song you are looking for. (A recent report said that 'MP3' was the *second* most searched for word on the internet...) Another good site to start from is <http://www.mpeg3.com>, which strives to act as a central hub for the Internet's MP3 community. There you'll find MP3 players, source code for developers, MP3 news, and up to date lists of MP3 sites — which for a variety of reasons tend to be a little more transitory than your normal homepage. ♦





# EA Directory of Suppliers

Which of our many advertisers are most likely to be able to sell you that special component, instrument, kit or tool? It's not always easy to decide, because they can't advertise all of their product lines each month. Also, some are wholesalers and don't sell to the public. The table below is published as a special service to EA readers, as a guide to the main products sold by our retail advertisers. For address information see the advertisements in this or other recent issues.

Supplier	State	A	B	C	D	E	F	G
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Jaycar Electronics	Eastern	•	•	•	•	•	•	•
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Obiat	NSW						•	
RCS Radio	NSW			•				
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## KEY TO CODING

A Kits and modules

B Tools

C PC boards and supplies

D

Components

E

IC chips and semiconductors

F

Test and measuring instruments

G

Reference books

Note that the above list is based on our understanding of the products sold by the firms concerned. If there are any errors or omissions, please let us know.

## Electronics Australia Reader Services

**SUBSCRIPTIONS:** All subscription enquiries should be directed to: Subscriptions Department, FPC Magazines, PO Box 199, Alexandria 1435; phone (02) 9353 9992.

**BACK ISSUES:** Available only until stocks are exhausted. Price A\$7.50 which includes postage within Australia only. **OVERSEAS READERS SHOULD ADD A FURTHER A\$2.50 FOR EVERY BACK ISSUE REQUIRED.**

**PHOTOCOPIES:** When back issues are exhausted, photocopies of articles can be supplied. Price \$7.50 per project or \$15 where a project spreads over several issues.

**PCB PATTERNS:** High contrast, actual size transparencies for PCBs and front panels are available. Price is \$5 for boards up to 100sq.cm, \$10 for larger boards. Please specify negatives or positives.

**PROJECT QUERIES:** Advice on projects is limited to postal correspondence only and to projects less than five years old. Price \$7.50. Please note that we cannot undertake special research or advise on project modifications. **Members of our technical staff are not available to discuss technical problems by telephone.**

**OTHER QUERIES:** Technical queries outside the scope of 'Replies by Post', or submitted without fee, may be answered in the 'Information Centre' pages at the discretion of the Editor.

**READER SERVICES BULLETIN BOARD:** (02) 9353 0627; ANSI, 24 hour access; any rate to 28.8kb/s.

**PAYMENT:** Must be negotiable in Australia and payable to Electronics Australia. Send cheque, money order or credit card number (American Express, Bankcard, Mastercard or Visa card), name and address (see form).

**ADDRESS:** Send all correspondence to: Reader Services Co-Ordinator, Electronics Australia, P.O. Box 199, Alexandria NSW 1435; phone (02) 9353 0620. (E-mail to [elt@hannan.com.au](mailto:elt@hannan.com.au))

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## Basic Electronics

by Peter Phillips

All new and up-to-date, providing an easy to read introduction to electronics for students and hobbyists. It even includes some simple DIY projects, to let you 'learn by doing it'!

On sale now at your newsagent for only \$5.95, or by mail order from EA Reader Services (PO Box 199, Alexandria 1435) for \$6.95 including postage and handling.

An EA Publication



**NOTE:** When ordering please quote  
The part numbers in ( ) where  
Part numbers are listed.

## HAVE YOU SEEN THE LATEST BARGAINS ON OUR BARGAIN CORNER WEB PAGE?

**LEDs, FLASHING LEDs & PHOTO  
TRANSISTORS** (NOTE: When buying  
LEDs that most STANDARD LEDs are  
only 1mC or less!!)

**3mm**  
3000 mC - YELLOW..... 10 for \$5  
300 mC - GREEN..... 10 for \$3  
1400 mC - RED..... 10 for \$6  
Photo Transistor..... 10 for \$5

**5mm**  
3000 mC - YELLOW..... 10 for \$6  
300 mC - GREEN..... 10 for \$4  
3500 mC - RED..... 10 for \$6  
Photo Transistor..... 10 for \$5

**5mm FLASHING**  
3000 mC - YELLOW..... 10 for \$10  
60 mC - GREEN..... 10 for \$10  
300 mC - RED..... 10 for \$10

**10mm**  
3000 mC - RED..... 10 for \$12  
**10mm FLASHING**  
400 mC - GREEN..... 10 for \$12  
3000 mC - YELLOW..... 10 for \$12

**5mm INFRA-RED**  
850nm 10 x the brightness of 880nm but  
have some visible red \$1.30 Ea. 10 for \$10

**\*\*\*\*\* MYSTERY BAG OF 100 LEDs \*\*\*\*\***  
**Contains: No standard LEDs!!!**  
All premium quality, or better with at least  
(if not more) 1blue, 1 ultra green and 1  
flashing. An absolute steal at \$8 per bag.

**BARGAIN PACK HIGH QUALITY 1.6 /  
5.6 SERIES SIEMENS CONNECTORS,**  
92 date code, See Siemens web site,  
compatible with new series. Some gold  
plating. For just \$15 for 24 high Quality  
co-axial connectors...

2x...43 - Panel or Line Push on Female  
5x...106 - Straight Line Male Push On  
2x...172 - Line Male Push On 45 Deg  
7x...169 - Panel or Line Female  
3x...171 - Line Female 90 Deg  
2x...173 - Straight Line Male  
2x...105 - Line Male 90 Deg  
1x...30 - 90 Deg Line Male  
An international supplier  
Lists similar connectors  
for more than 10 times The price!!!

**POWERFUL 80 IR ILLUMINATOR**  
With strong universal swivel  
mount & 50X50X50mm  
housing: \$36 Just \$18  
With any camera purchase

**NEW STEPPER MOTORS**  
30 oz./in. torque, 2.5 deg. 144 step, low  
voltage, compact 57 x 38mm: \$14

**TWO STEPPER MOTOR DRIVER  
DRIVER KITS WITH MOTORS**

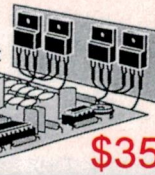
**\*\*\*STEPPER MOTOR DRIVER KIT #1\*\*\*  
COMPUTER CONTROLLED STEPPER  
MOTOR KIT:** can drive larger motors, has  
optoisolation. Inc. software and notes: \$40  
or \$50 with two used 23 frame 200 step 1.8  
deg. motors!!

**STEPPER MOTOR  
DRIVER #2 KIT** Inc. a large  
used 1.8 deg. (200 step /  
rev 23 frame) motor & uses  
SAA-1042A IC. Controls.  
inc. ext. clock, on-board  
clock CW or CCW rotation,  
half / full step, enable/disable, with one :  
\$20 / 2 motors: \$30

**OATLEY ELECTRONICS**  
PO Box 89 Oatley NSW 2223  
Ph (02) 9584 3563 Fax 9584 3561  
orders by e-mail: oatley@world.net  
http://www.oatleyelectronics.com  
major cards with ph. & fax orders,  
Post & Pack typically \$6

## KITS OF THE MONTH

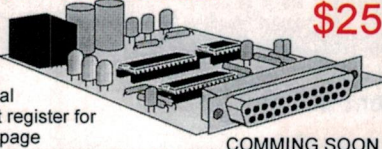
**12VDC - 240AC INVERTER** Features include modified square  
wave output, Auto start with load sensing, Uses six power MOS-  
FETS with minimal heatsinking required. 200 - 600VA. dependant  
on trans former size. To save money you can use an  
rewind your own transformer. Basic kit includes  
pcb & all on-board components + 4 X 60A  
MOSFETS. \$35 Requires 240V to  
8-0-8 V transformer.  
Ref or E-Mail for more details.



**\$35**

### NOW TRY OUR PROFESSIONAL PIC MICRO PROGRAMMER

Programs up to 39 different types of  
PIC chips, Software works under  
DOS, WIN 3.xx and WIN 95, Quick  
Easy construction, Connects to Pc's  
parallel port. Download fully functional  
evaluation software from the Internet register for  
a small fee. More details on our web page



**\$25**

COMING SOON

**WE ARE LOOKING TO BUY NEW & USED SURPLUS OR OBSOLETE STOCK  
COMPONENTS, MODULES, PCBs, MECHANISMS, MOTORS, GEAR BOXES,  
HOUSINGS, CABLES, CONNECTORS, SWITCHES, METERS, COMPLETE  
ASSEMBLIES JUST CALL OR FAX WITH THE DETAILS. WHAT MIGHT APPEAR  
TO BE WORTHLESS TO YOU MAY BE VALUABLE TO US. LARGE OR SMALL  
QUANTITIES YOU MAY BE SURPRISED WHAT YOUR STOCK IS WORTH!!!**

### LASER DIODE POINTER KIT

Did you ever imagine you  
could buy a very bright  
laser for just \$15?  
well guess again!!! (K35)



**\$15**

### NEW 1/2/3 AXIS CNC SYSTEM.

(computer numerical control) This system  
includes a new stepper motor driver kit  
(one kit required for each axis) designed to  
be used with software freely available on  
the Internet for use with home or  
professionally built a milling machine,  
lathe, engraver or cutter etc. with home &  
limit switches and a high degree of  
accuracy (can be better than .001". We  
supply the kit inc. Pcb all on-board  
components etc. plus Internet resources  
shareware software & building or buying  
mechanical components. Around \$30 per  
axis. Call for further details.

### UNIDIRECTIONAL ELECTRET MICROPHONE

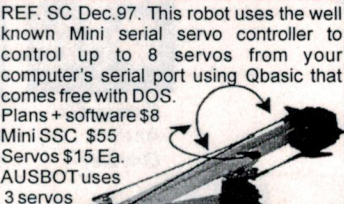
New quality product  
with clip, 3M lead.  
2.5mm plug: \$4 Make  
a stage quality wireless  
microphone by combining  
it with our FMTX MK2 trans-mitter kit: \$16  
for the kit plus the microphone



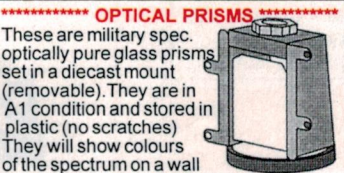
**\*\*\* NEW \*\*\* NEW \*\*\* NEW \*\*\*  
HIGH POWER IR TRANSMITTER AND  
RECEIVER** Applications include data  
transmitter, powerful Passive infrared de-  
tector, IR invisible fence / gate & doorway  
monitor. Range: with 5 IR LEDS (can drive  
up to 50 LEDS) passive mode 10m (5  
LEDs), active mode 40m (5 LEDS). Range  
can be boosted with a cheap torch re-  
flector. The kit has active high & active low  
outputs for relays etc Simple to construct  
PCB can be cut into two for active mode or  
for data transmission. Kit inc. PCB, all on-  
board components, 5 IR LEDS & salvaged  
new plastic case All for \$28

### 2 AXIS ROBOTIC ARM WITH GRIPPER

REF. SC Dec.97. This robot uses the well  
known Mini serial servo controller to  
control up to 8 servos from your  
computer's serial port using Qbasic that  
comes free with DOS.  
Plans + software \$8  
Mini SSC \$55  
Servos \$15 Ea.  
AUSBOT uses  
3 servos



**\*\*\*\*\* OPTICAL PRISMS \*\*\*\*\***  
These are military spec.  
optically pure glass prisms  
set in a diecast mount  
(removable). They are in  
A1 condition and stored in  
plastic (no scratches)  
They will show colours  
of the spectrum on a wall  
when placed in sunlight \$12.50  
We also have a small Quantity of very  
large prisms "RING FOR DETAILS"



### BASIC PIC MICRO PROGRAMMER JUST

Learn program your own 16F83 /16F84  
/16C84 micro-controllers the easy way  
with this simple kit that just plugs in to your  
Pc's printer port and uses these small,  
cheap but powerful chips. Kit inc. program  
examples and notes PCBs, all on-board  
components, Db25 connector and a PIC  
chip ready to program. An incredible  
bargain at just \$27  
Software  
available  
free to Download  
From our web page

### KEY-CHAIN LASER POINTER

Very bright 650nm laser pointer  
in a high quality machined  
metal housing

**\$20**

### FOR SALE TO ADULTS ONLY VERY BRIGHT LASER MODULE

650 laser module as  
used in the  
above pointer.  
(Lm2)

**\$18**

### FOR SALE TO ADULTS ONLY PROFESSIONAL FOG MACHINES

This unit would be the perfect partner to  
our laser light shows, ideal  
for discos, parties  
fashion parades  
etc. A special  
intro. price of  
under \$200  
Coming soon  
Reserve one now (G51)

### CGA COLOUR MONITOR.... NEW 12V

DC-1A 6" colour monitor,  
ready to be enclosed,  
no housing, just the tube,  
driver PCB's and data  
sheet.  
now just \$40 (G62)

### \*\*\*\*\* NIGHT VISION \*\*\*\*\*

Back in stock. We have a  
limited quantity of deep  
Infra-red night vision  
tubes + lenses & sup-  
plies to suit. "RING US"

### 20-30 SECOND DIGITAL SOUND RECORDER KIT.

This could be used as an  
answering machine at your front door or as  
a personal reminder device. Good quality  
sound Uses LSI chip with memory etc.  
built in. Kit includes  
PCB all on-board  
components,  
microphone,  
switches & speaker: \$14 (K124)

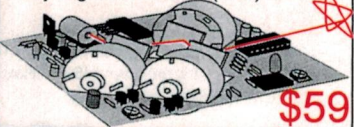
### Series 13 - 4 CHANNEL UHF RECEIVER:

Ref. EA Mar 94. Control up to 4 output  
relays. Uses a pre-built and pre-aligned  
UHF (304MHz) receiver module & security  
coding ICs. Output relays have 5A contact  
ratings and can be configured for toggling  
operation at each press of a Tx button or  
momentary operation when Tx button is  
pressed. 1 X 3ch transmitter plus 1 X 4ch  
receiver: \$50 extra Tx \$15 is req. to access  
the fourth relay. 12V operation. (K39) \$70

**FREE ADS ON OUR WEB SITE  
CONDITIONS APPLY. E-Mail us.  
E-mail: oatley@world.net**

### NEW SUPER LOW PRICE + LASER AUTOMATIC LASER LIGHT SHOW KIT:

**MKIII.** Automatically changes every 5 - 60  
secs, & is adjustable. Each motor has 8  
speeds, one motor is reversible, & one can  
stop. Countless great displays from single  
to multiple flowers, collapsing circles,  
rotating single and multiple ellipses, stars,  
etc. Easy mirror alignment with "Allen  
Key". Kit inc. PCB, all on board com-  
ponents, three small DC motors, mirrors,  
precision adjustable mirror mounts: (K115)  
+ very bright 650nm laser (LM2) module.



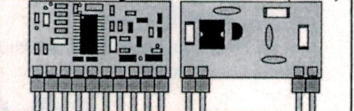
**\$59**

**\*\*FREE CHRISTMAS GIFT\*\*  
A WIRING KIT WITH EACH ORDER**  
Add \$1 for each extra wiring kit.

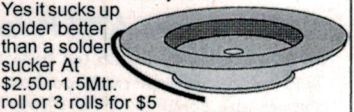
**LARGE 70mm HIGH 7DIGIT 7 SEG.  
Std. LED DISPLAY PCB ASSEMBLY.**  
(no data available) JUST \$20 (D12)



**UHF DATA TRANSMISSION**  
Stamp sized Xtal locked 433.9MHz  
superhetrodyne receiver module \$25  
Small matching transmitter kit: \$12 (K122)



**\*\*\*\*\* SOLDER MOP \*\*\*\*\***  
Quality SERVISO SOLDER MOP (UK)  
brand This stuff really sucks!!!  
Yes it sucks up  
solder better  
than a solder  
sucker At  
\$2.50r 1.5Mtr.  
roll or 3 rolls for \$5



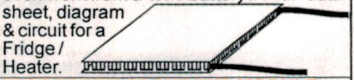
**\*\* CCD CAMERA SPECIAL \*\*  
WITH A FREE VHF MODULATOR**

The best "value for money" CCD camera  
on the market! 0.1 lux, High IR response &  
hi-res. Performs better than most cheaper  
models. 42mm With: Pinhole (60deg.), 78  
deg., 92 deg., 120 deg., \$89  
or 150 deg.: \$104  
32mm With: Pinhole (60  
deg.), 92 deg., 120  
deg., \$110, 150 deg.: \$125

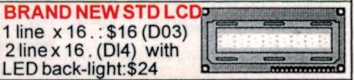


### VERY EFFICIENT WHITE LIGHT - LCD DISPLAY: (ref. EA.) New Sharp 640 x 480

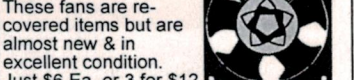
LCD which features an easily removed  
very efficient cold cathode Fluorescent  
lamp 5mm X 150mm. Gives useful white  
light @ about 1-3WAC input, 10000 hour  
life! Display + Backlight Inverter Kit (Needs  
12V-150mA): (D11) \$17 (D12) \$2)



**STEADY STATE 4-6A PELTIER EFFECT  
COOLER / HEATER 3.3A@14V(GP1)**  
PELTIER: \$27, 6A@15V(GP2) Peltier:  
\$35, both approx. 40X40X4mm, temp.  
Control via supply voltage / current, will  
even work from a 1.5V battery!!! With data  
sheet, diagram & circuit for a  
Fridge/  
Heater.



**IR RECEIVER FRONT END MODULE**  
Contains an IR receiver diode,  
amp tuned to 38KHz, a band-  
pass filter, an AGC section & de-  
tector circuit. \$2 Ea or 10 for \$15



### BRAND NEW LCD

1 line x 16 : \$16 (D03)  
2 line x 16 : (D14) with  
LED back-light: \$24

### \*\*\* 240V 6" FANS \*\*\*

Good but limited qty.  
These fans are re-  
covered items but are  
almost new & in  
excellent condition.  
Just \$6 Ea. or 3 for \$12





# Where do you GO for the last word in electronics?

## Great ideas for Christmas!

### Bits and pieces compartment box **BUY 4 GET 1 FREE!**

Great for storing small products within the 15 dividable compartment. This modular system allows you to expand vertically or horizontally.

H 2494

**\$9<sup>95</sup>ea**



### Solar 4-in-1 construction kit

Make heaps of different designs (an aeroplane, or helicopter etc) with this plastic construction kit. Includes a motor which is powered by a small solar module.

O 2033

**\$19<sup>95</sup>**



### Pocket workshop

Sturdy fold-up stainless steel pliers with a range of fold-out tools. Includes leather storage case.

T 3308

**\$24<sup>50</sup>**



### Solar powered AM/FM radio

Excellent for emergency kits, this compact radio has a built-in FM antenna and can be powered four ways: through solar power, an AC/DC adaptor, AA batteries or a Dynamo generator.

O 2051

**\$29<sup>95</sup>**



### Solar powered radio/torch/siren

A must for Summer camping trips, this compact torch with radio has AM/FM reception, an emergency siren, flashing torch and can be powered through solar energy, an AC adaptor, AA batteries or a Dynamo generator.

O 2052

**\$39<sup>95</sup>**

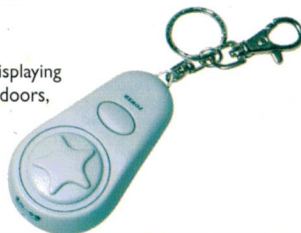


### 5-pattern laser pointer

Great for meetings and presentations. A novel 1mW pointer displaying either a star, dot, I♥U, circle and \$ symbol. Up to 50m range indoors, with adjustable focus control. Includes batteries.

T 2901

**\$46<sup>95</sup>**

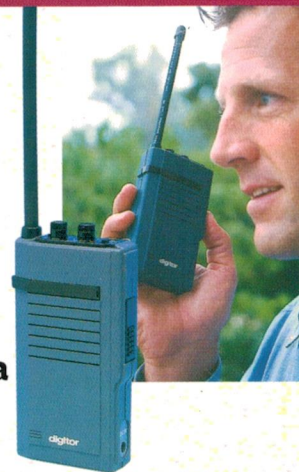


### Long-range 55MHz FM transceiver

Handheld or handsfree operation, clear VHF FM sound, 300m maximum range. Includes mini mic. and earpiece for handsfree operation. No licence required.

D 1095

**\$69<sup>95</sup>ea**



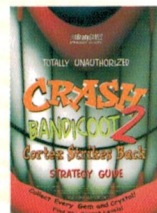
## BOOKSBOOKS



**Banjo-Kazooie  
Unauthorised  
Guide**

B 9720

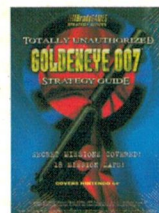
**\$14<sup>95</sup>**



**Totally  
Unauthorised  
Crash  
Bandicoot 2**

B 9708

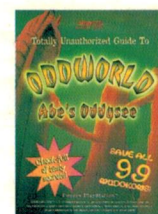
**\$14<sup>95</sup>**



**Totally  
Unauthorised  
GoldenEye**

B 9714

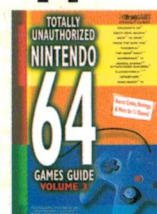
**\$19<sup>95</sup>**



**Oddworld:  
Abe's  
Odyssey**

B 9718

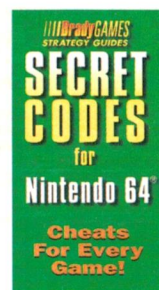
**\$19<sup>95</sup>**



**Totally  
Unauthorised  
N64 Guide**

B 9706

**\$19<sup>95</sup>**



**Secret Codes  
N64**

B 9716

**\$19<sup>95</sup>**

**PHONE FAX &  
MAIL ORDERS**

**PHONE:** 1300 366 644 (Local Call Charge) **FAX:** (02) 9395 1155

**MAIL:** **DICK SMITH ELECTRONICS**, Direct Link Reply Paid 160,  
PO Box 321, North Ryde NSW 1670 (No Stamp Required)

**Please add postage (up to 5kg) to your order, as follows:**

• \$4.00 (\$1 Up To \$50) • \$7.50 (\$51 Up To \$100) • \$9.00 (\$101 Up To \$500) • \$11.00 (over \$500)  
(quote available for air/road freight or if over 5kg) email: directlink@dse.com.au (enquiries only)

• Major Credit Cards Accepted. • Gift Vouchers Available

**direct link**

**efpos**  
Not available at all  
authorised stockists.

For further information, orders or the location of your nearest store call:  
**1300 366 644 (Local Call Charge) Or Fax: (02) 9395 1155**

**DICK SMITH  
ELECTRONICS**

*That's where you go!*